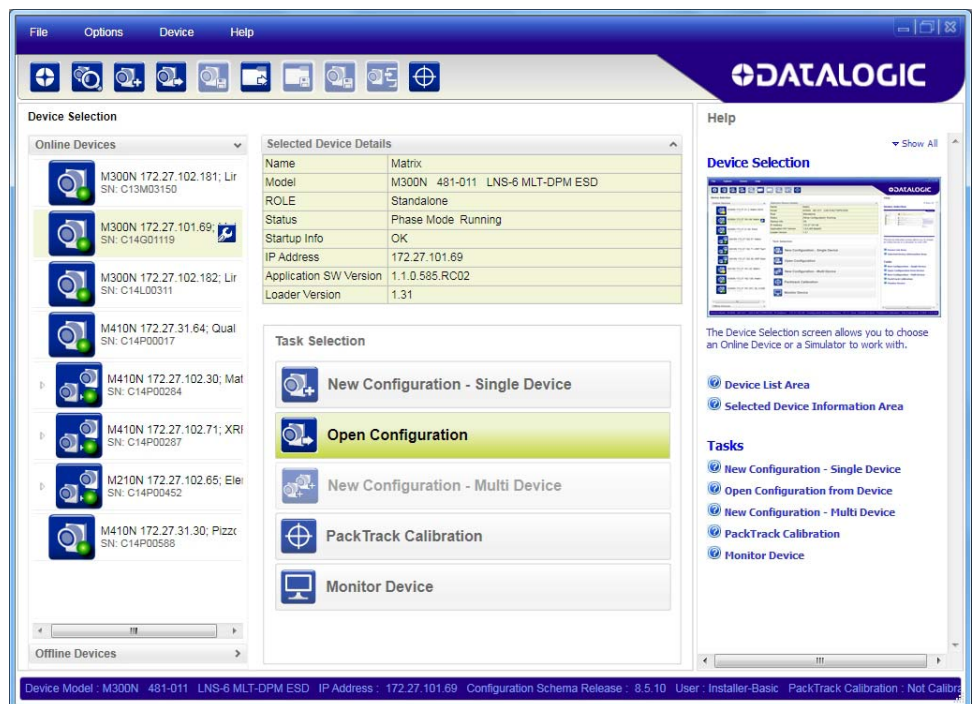


# USER'S MANUAL



> DL.CODE™



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DL.CODE™ User's Manual

Ed.: 03/2015

This manual refers to software version 1.10 and later.

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## REFERENCES

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### CONVENTIONS

This manual uses the following conventions:

"DL.CODE™" refers to the Datalogic User Interface client application running on a PC.

"User" or "Installer" refer to anyone using DL.CODE.

"Device" refers to physical devices used in the reading stations: i.e. Matrix readers.

"You" refers to the System Administrator or Technical Support person using this manual to install, configure, operate, maintain or troubleshoot a plant equipped with DL.CODE.

### REFERENCE DOCUMENTATION

The documentation related to DL.CODE™ is listed below:

- Device specific Help On Line
- This User's Manual

### SUPPORT THROUGH THE WEBSITE

Datalogic provides several services as well as technical support through its website. Log on to **www.datalogic.com** and click on the **Industrial Automation** links for further information:

- **PRODUCTS – FIXED INDUSTRIAL BARCODE READERS**

Select your product from the links on the **Fixed Industrial Barcode Readers** page. The product page describes specific Info, Features, Applications, Models, Accessories, and Downloads including documentation, software drivers, and utility programs.

- **SUPPORT & SERVICES – INDUSTRIAL AUTOMATION**

Several links from the **Industrial Automation** list take you to additional services such as: Service Program which contains Maintenance Agreements and Warranty Extensions; Repair Centers; On-Line RMA Return Material Authorizations; Technical Support through email or phone; Downloads for additional downloads.



# 1 INTRODUCTION

DL.CODE™ software is a User Interface client application that provides reading device configuration for Standalone and Master/Slave configurations. It is installed in and runs on Windows-based PCs (usually laptops), and connection takes place through an Ethernet TCP/IP interface.

It also provides visual monitoring of images that can be stored in an Image Database either locally on the device or to the local or a remote PC.

DL.CODE provides PackTrack Calibration for omnidirectional reading and tracking stations used in Logistics applications.

DL.CODE offers statistic and diagnostic information at reading station level whether the station is made up of a single reader or several readers connected in a Master Slave configuration.

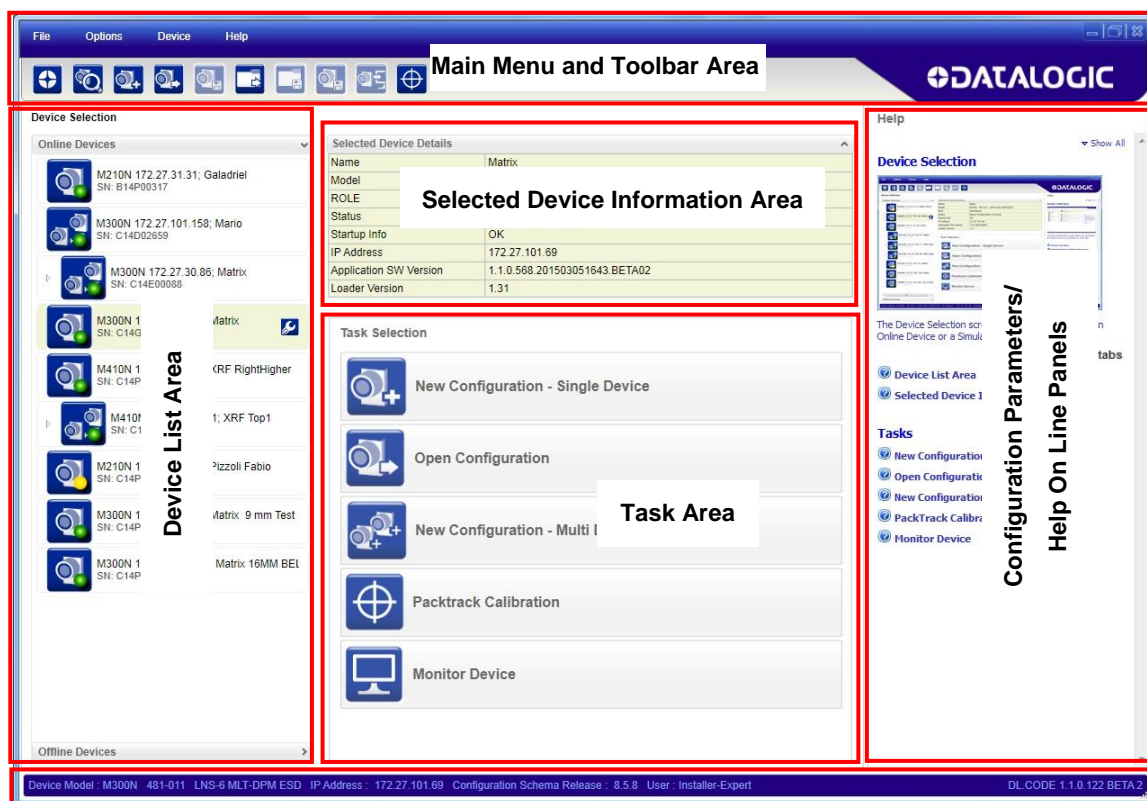


Figure 1 – Main Window Areas

## 1.1 MAIN FEATURES

A summary of the DL.CODE main features is listed below:

- Simultaneous Device Monitoring from different remote PCs
- 3 different access levels
- User and Session Language configuration in real time
- System configuration
- Dynamic content and automatic page update

## 1.2 CONFIGURATION AND MONITORING SESSIONS

Device configuration can be performed using DL.CODE running on a remote PC through a single session. Multiple instances of DL.CODE cannot be run on a PC and once a device is connected for configuration it cannot be accessed by another PC running DL.CODE.

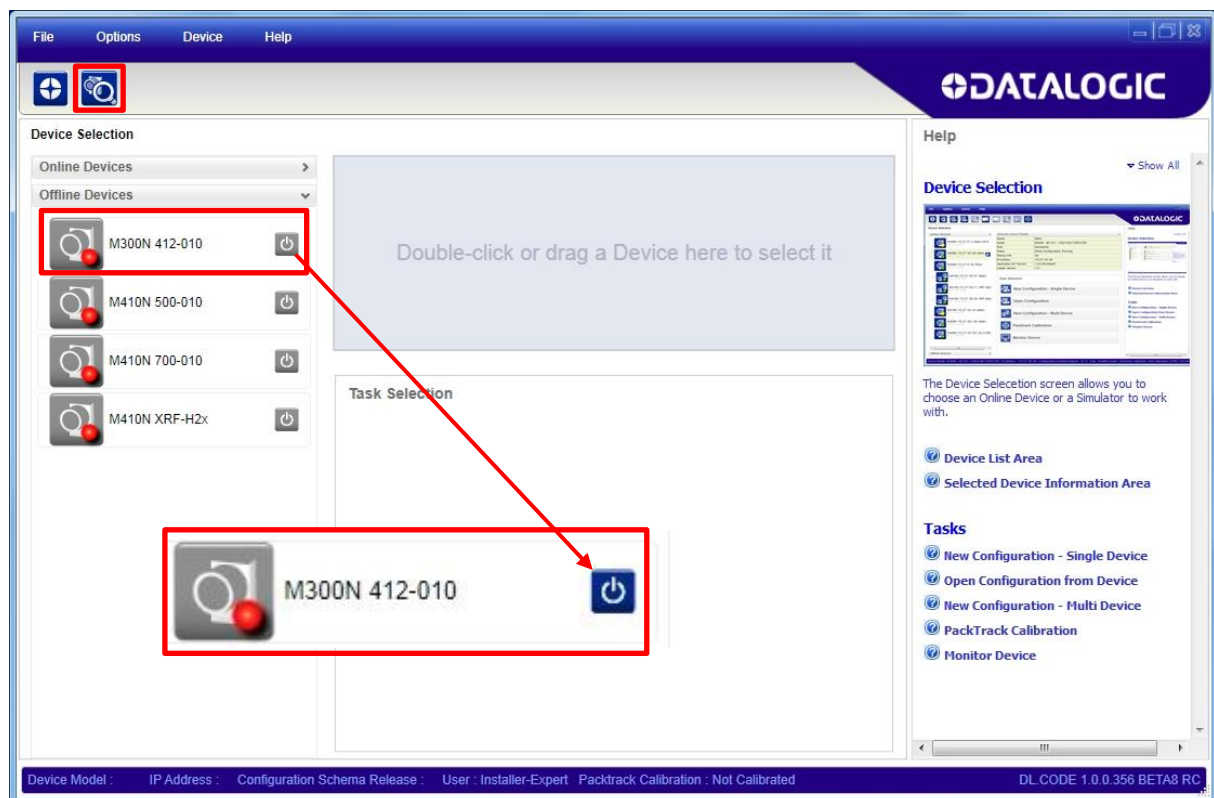
However the Monitoring feature can be accessed simultaneously by several PCs running DL.CODE.

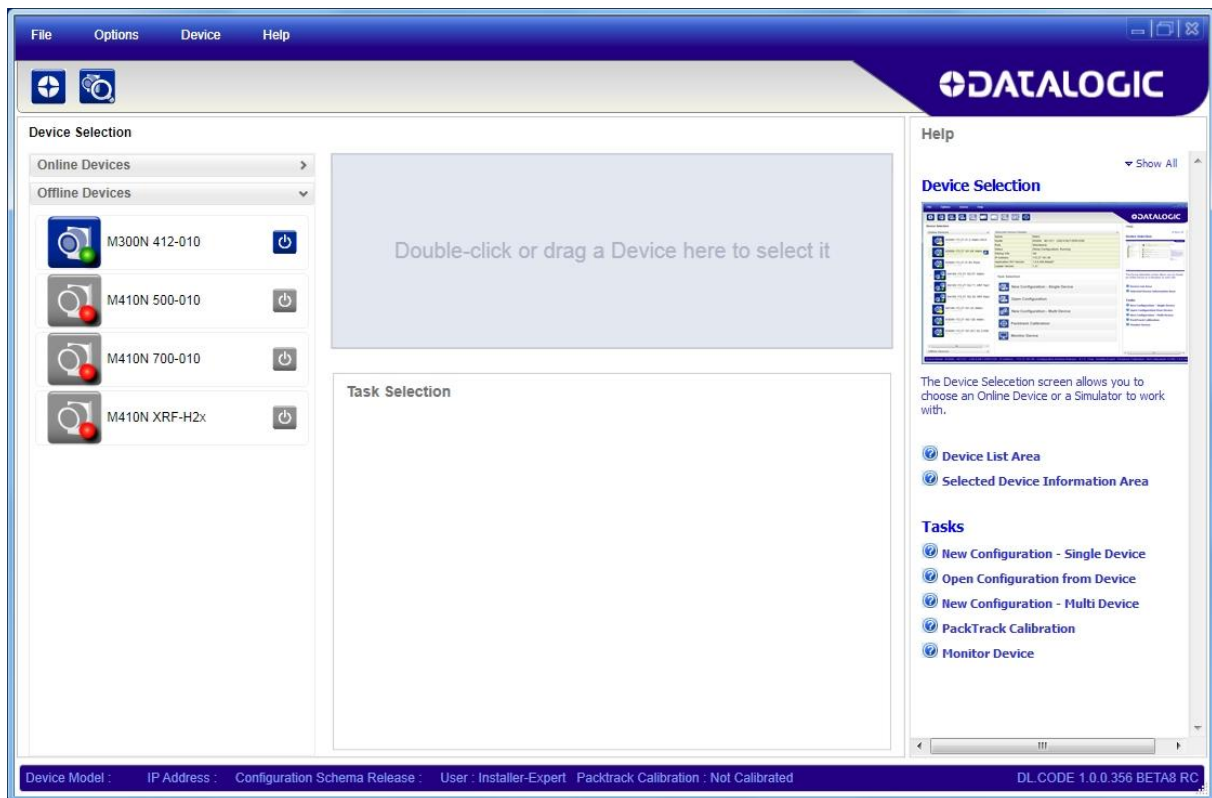
## 1.3 SIMULATORS

DL.CODE has different device prototypes which can be loaded as Offline devices. This allows offline configurations to be prepared and loaded to a device at a later time.

To load a Simulator, Click on the *Offline Devices* tab to open the list of available simulators.

Click a Simulator Power button icon to select it and then the *Discovery* icon to run a new device search to find it.





Now you can drag the simulator into the Selected Device Information Area and begin a new configuration. See Chapter 3.

## 1.4 DEVICE CONFIGURATION

DL.CODE is designed to simplify standard configuration by grouping the basic functions into three major parameter groups: Decoding, Operating Mode, and Output.

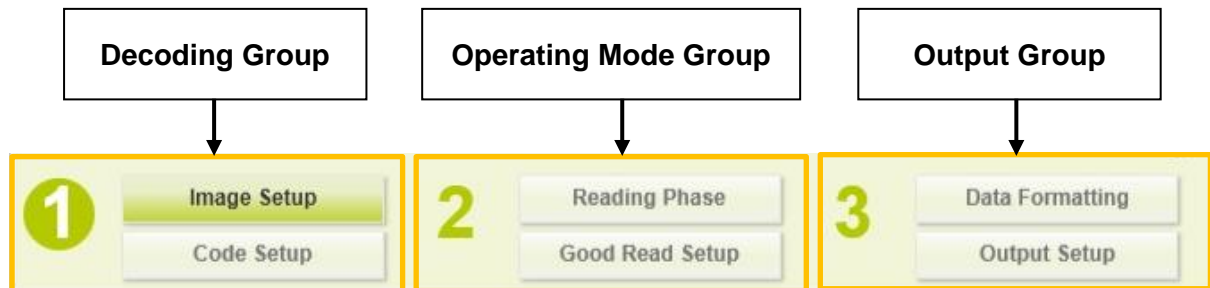


Figure 2 – DL.CODE Configuration Groups

Each major group is sub-divided into two parts as follows:

### 1. Decoding:

- **Image Setup:** this group manages the photometry for image acquisition. It contains a **Focus Calibration** tool with oscilloscope for manual focusing, and most importantly an **Image Auto Setup** routine to automatically set the photometry.
- **Code Setup:** this group manages code symbology selection and configuration including Code Filtering parameters and the ROI windowing tool. It also contains the **Code Autolearn** routine to find unknown code symbologies on an acquired image. For DPM applications it also provides an advanced **DPM Autolearn** routine (see chp. 11).

### 2. Operating Mode:

- **Reading Phase:** this group manages the operating mode for image acquisition.
- **Good Read Setup:** this group manages data collection: Code Collection, Code Combination, Code Presentation, or Match Code.

### 3. Output:

- **Data Formatting:** this group manages the output message to the Host.
- **Output Setup:** this group manages the digital outputs as well as the Green/Red Spots.



## 2 INSTALLATION

---

### 2.1 DL.CODE DISTRIBUTION CONTENTS

The DL.CODE program distribution contains the following:

- Complete Installation of DL.CODE
- .NET Framework (if not already present)
- This manual

### 2.2 HARDWARE REQUIREMENTS

Typical hardware requirements for a DL.CODE Client PC are:

- 2.00 GHz or faster microprocessor
- 1 GB RAM
- 2 GB hard disk for 64-bit machines; 1 GB hard disk for 32-bit machines
- 100 Base-T Ethernet
- One 19" or larger monitor (optimized for 1280x1024 resolution)

### 2.3 SOFTWARE REQUIREMENTS

- One of the following Windows Operating System:
  - Windows XP (32 or 64-bit)
  - Windows Vista (32 or 64-bit)
  - Windows 7 (32 or 64-bit)
- Web Browser: Google Chrome, Mozilla Firefox, Microsoft Internet Explorer, Opera, etc.



**NOTE:** The Google Chrome Web Browser is recommended for its superior performance characteristics.

### 2.4 INSTALLING DL.CODE

Download from the web and run the DL.CODE installer: **DL.CODE X.x\_Setup.exe**.

When the installation is complete the DL.CODE entry is created in the Start>Programs bar under "Datalogic" as well as a desktop icon.

To run DL.CODE double-click the desktop icon or select it from the Start>Programs>Datalogic entry.

## 3 QUICK START

To help you get started, here is an example configuration demonstrating the basic steps of DL.CODE configuration.

To configure your device for your application using DL.CODE, the following preliminary steps are assumed:

- The reading device(s) are installed and running.
- DL.CODE is installed and running (chapter 2).

### 3.1 DEVICE DISCOVERY

The User Interface opens and displays a list of all the devices belonging to the Local Area Network. DL.CODE has a discovery feature to accomplish this task.

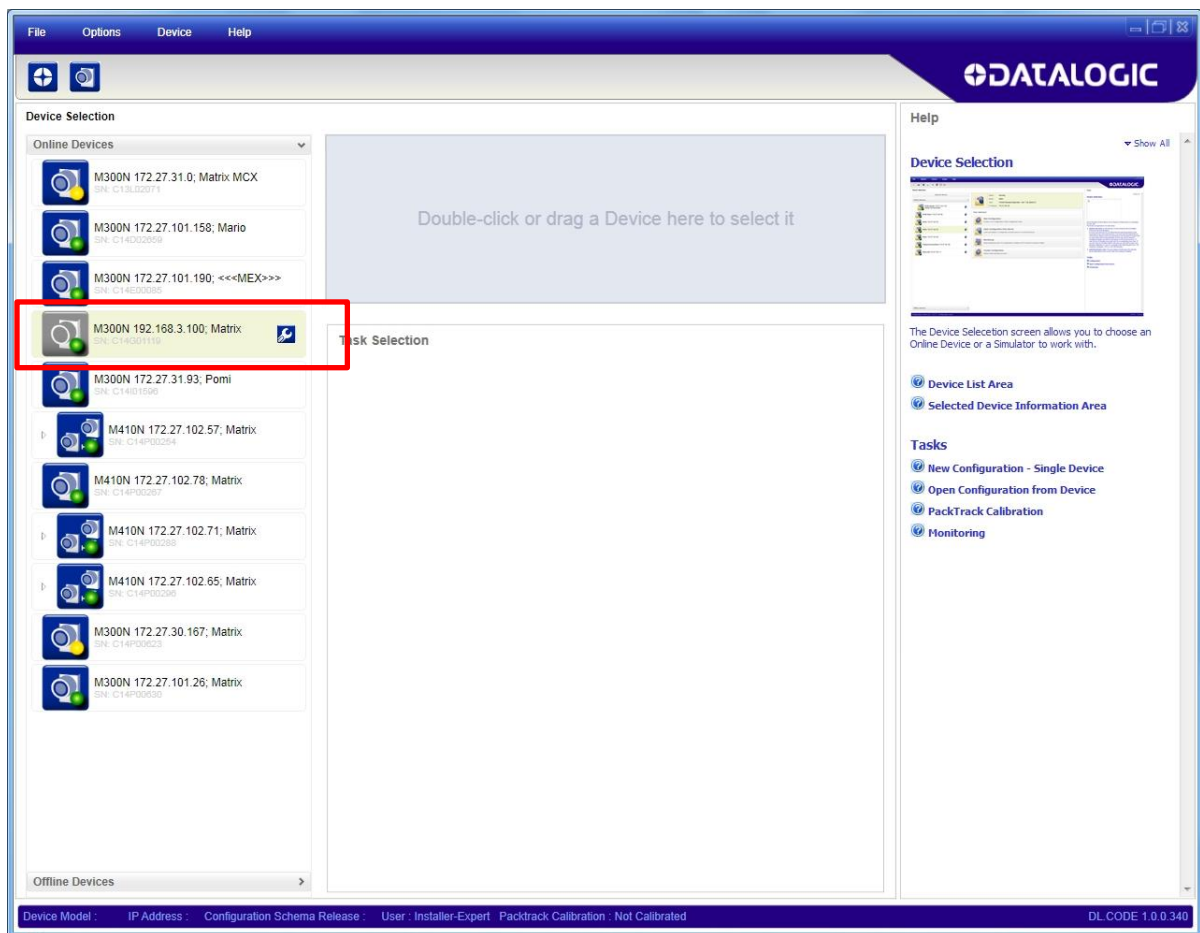



Figure 3 – Device Discovery

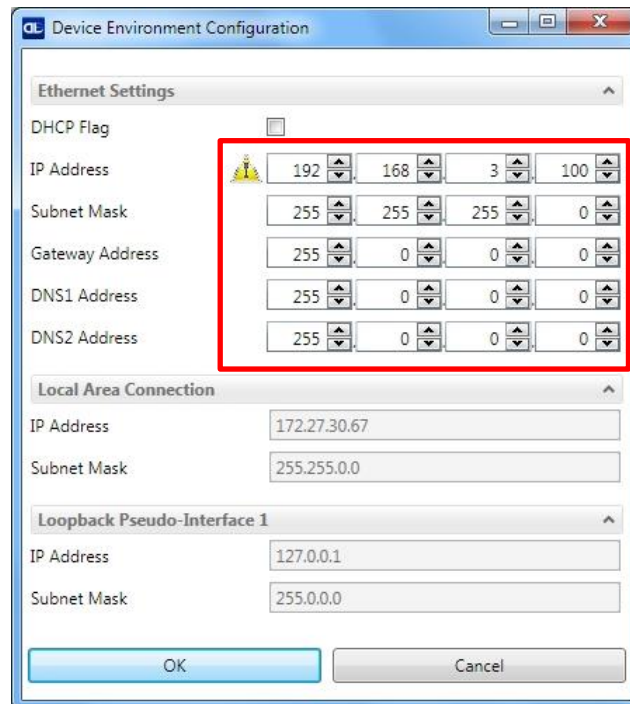
The discovery feature will also show devices not belonging to the LAN and display them in grey (see Figure 3).

The following procedure will demonstrate an example configuration.

1. First the device must be added to the LAN by aligning its IP Address to the network. The network administrator should provide valid LAN address(es).

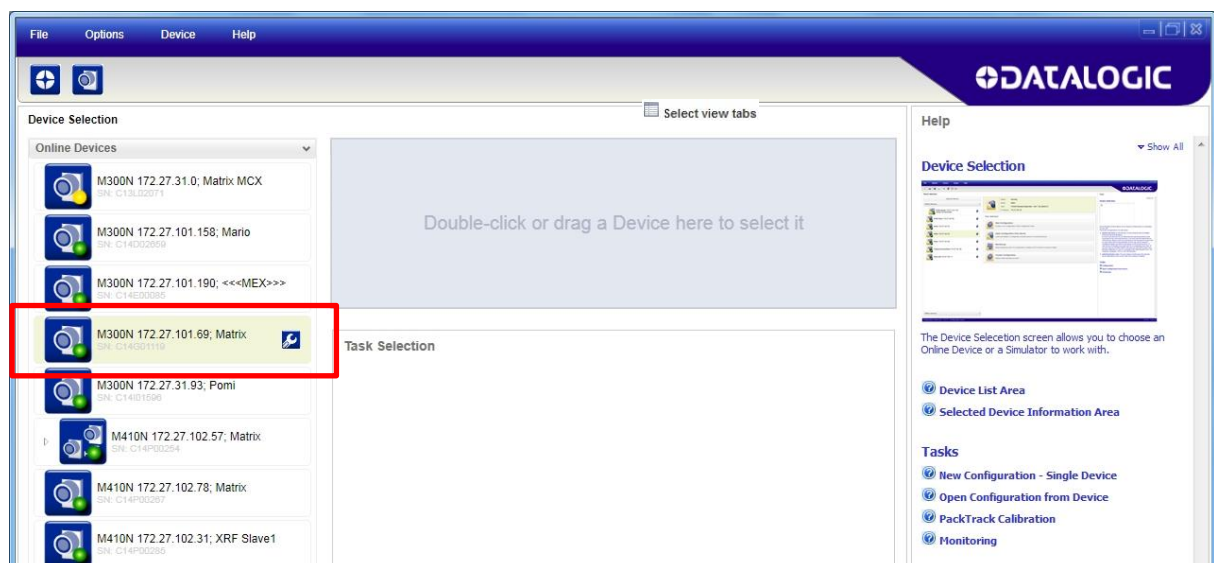
Click on the device wrench icon  (or the Device>Settings>Environment menu) to open the Device Environment Configuration window.

Change the Ethernet Settings (IP Address, Subnet Mask, Gateway Address etc.) according to the network requirements.

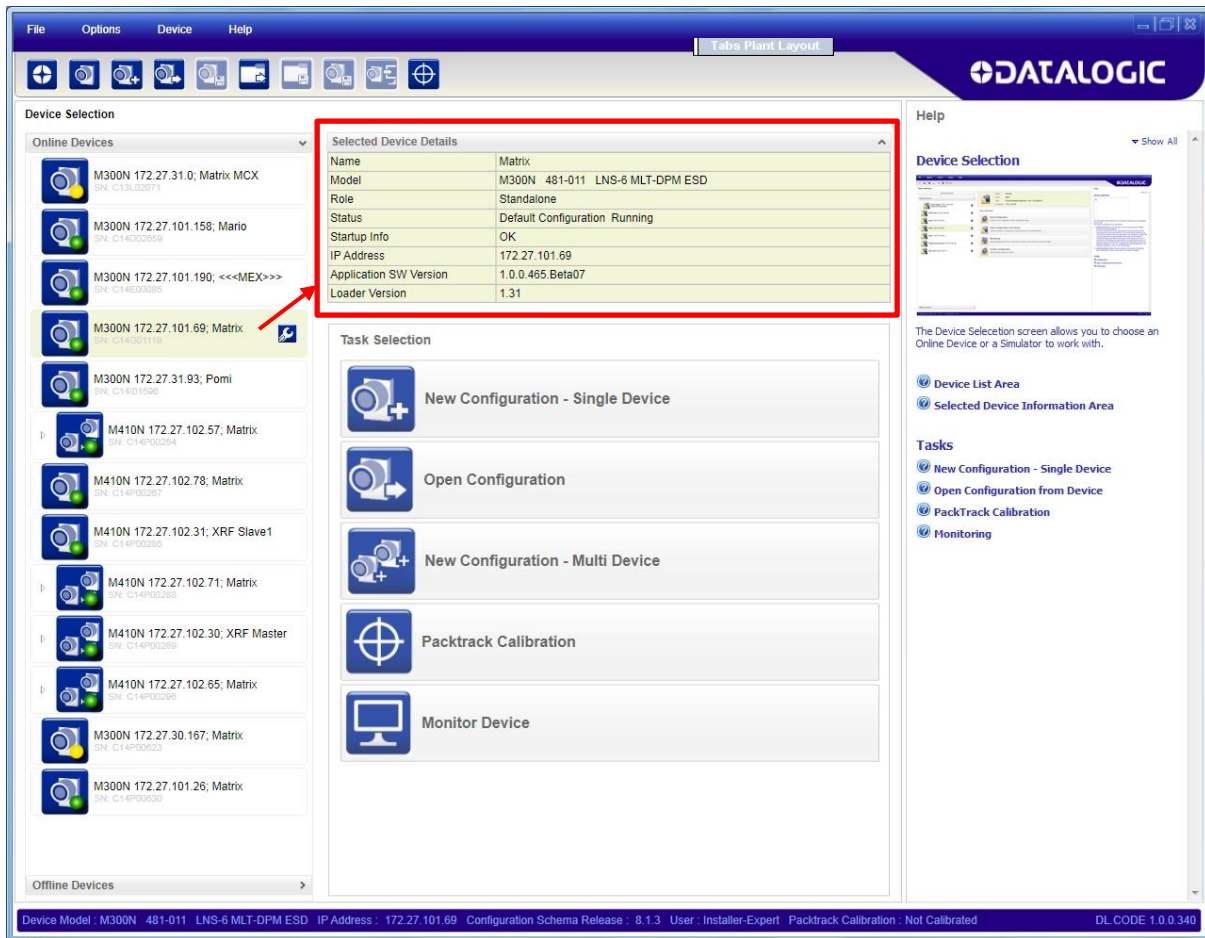


**Figure 4 Device Environment Configuration Window**

Click OK; the device will be reset and will reappear in the list of Online Devices (in color) meaning it is now part of the LAN and can be configured. The new IP address will also be displayed.



2. Double-click on or drag the device icon into the Selected Device Information Area. Details about the device will be displayed in this area.



## 3.2 DECODING CONFIGURATION PARAMETERS

The Decoding Configuration parameters are divided into two groups: optical/illumination parameters called **Image Setup** and code definition parameters called **Code Setup**.

Decoding Group



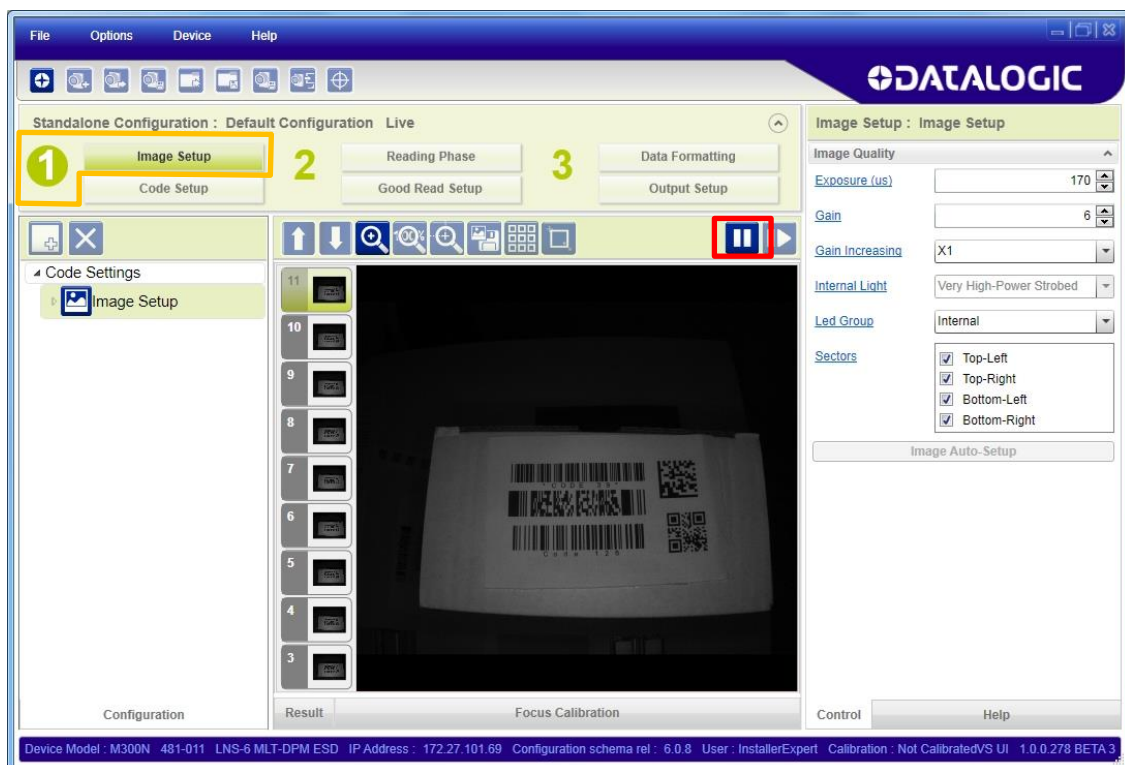
### 3.2.1 Image Setup

To begin configuration, the reader must be correctly mounted so that its Field of View covers the application reading area.

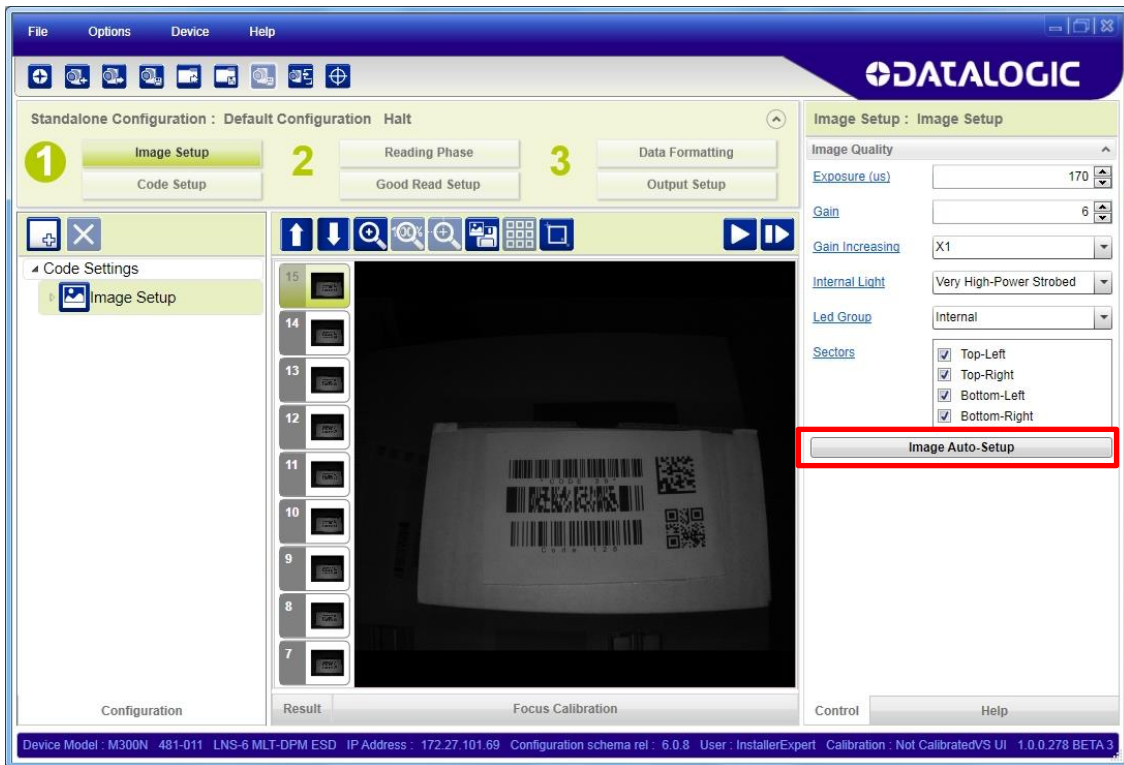
1. From the Task Area select New Configuration – Single Device. The device enters run mode and begins acquiring images.



2. Place the application specific code(s) in the reading area. Once positioned, stop image acquisition by clicking on the Pause button.




- Click the Image Auto Setup button to automatically acquire the best exposure time and gain values.



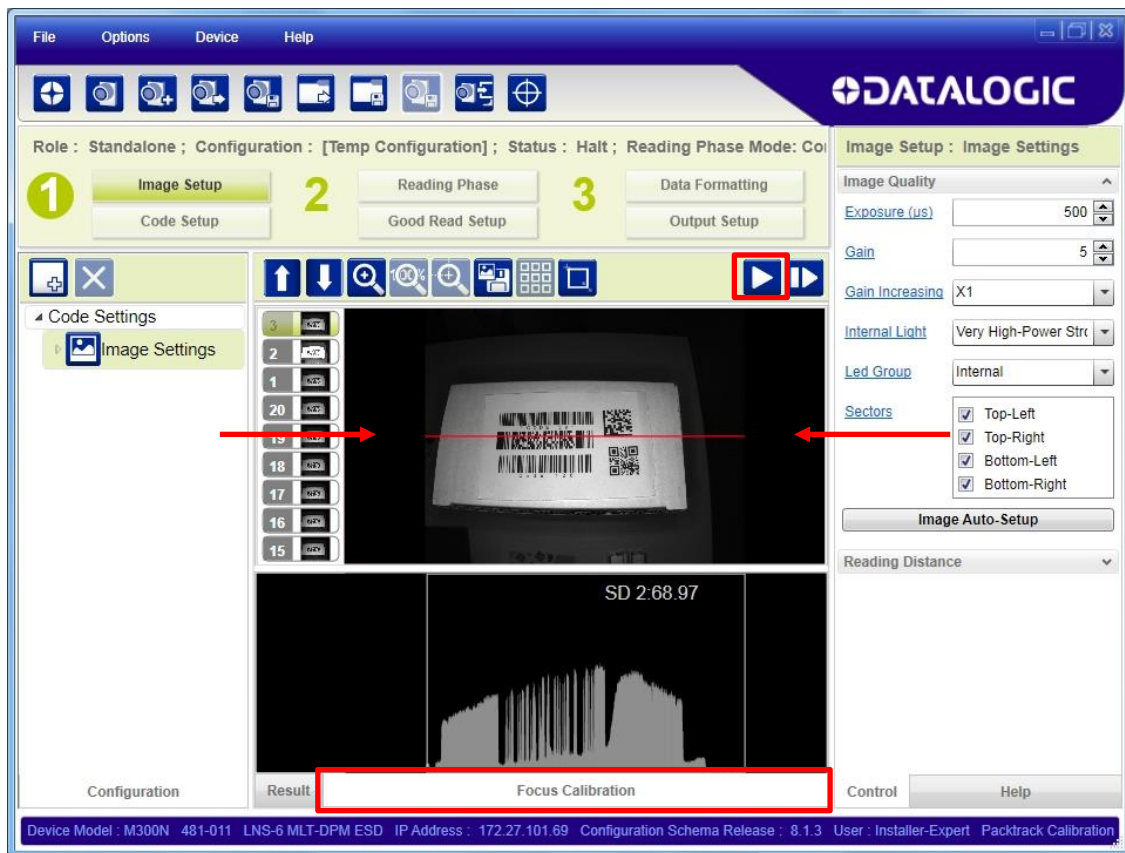
Select the Static or Dynamic Self-Tuning option; Start Autolearn and Apply to the Image Setup.



**NOTE:** For applications having multiple lighting or code reading conditions, up to 10 different Image Setups can be configured by adding them with the  icon.



- Now click on the Focus Control tab at the bottom of the window. The oscilloscope view is shown in the bottom panel and can be used for manual focus adjustment.

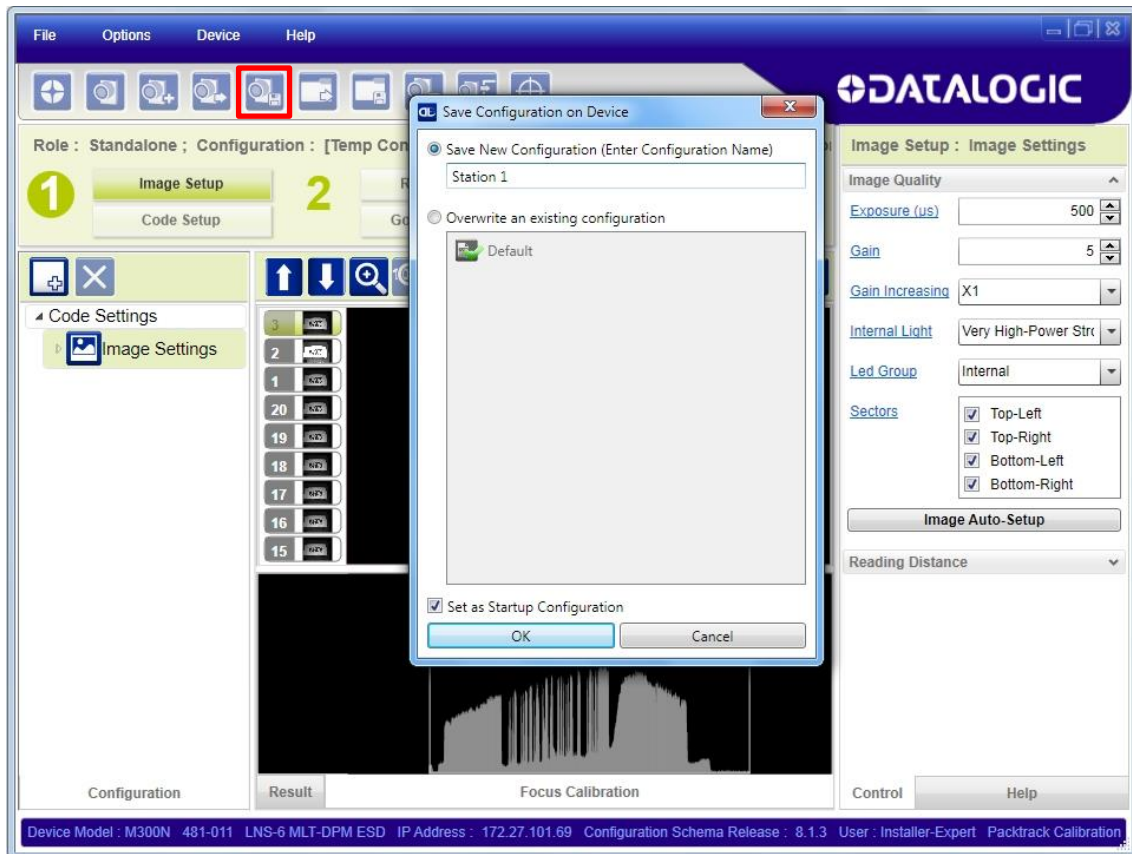


The red line in the image panel above the oscilloscope must pass through the code. Click Play to enter run mode and reposition the code. While in run mode, manually adjust the focus until the bars relative to the code in the oscilloscope demonstrate their maximum length (focus).

Click Pause to stop image acquisition.



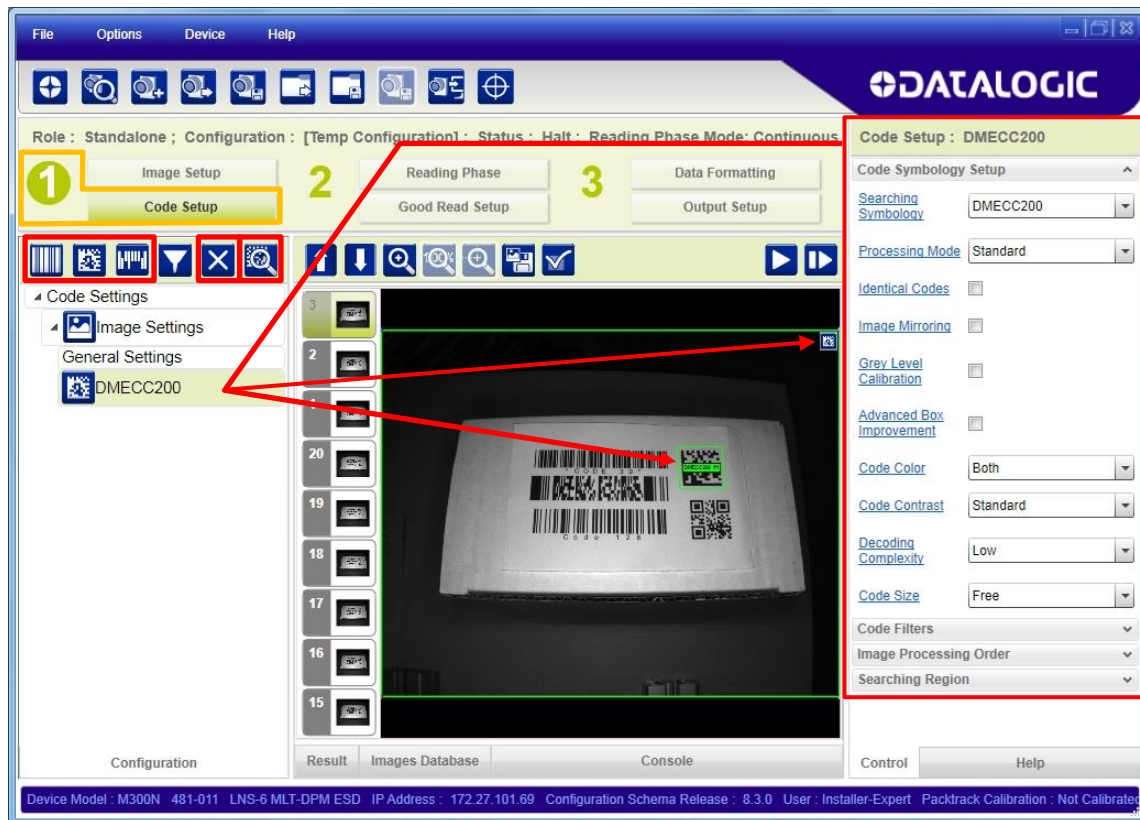
**NOTE:** At this point it is probably a good idea to save the configuration from temporary memory to permanent memory giving it a specific name.







### 3.2.2 Code Setup

1. Click on the Code Setup button. By default, the Data Matrix ECC 200 symbology is enabled. If this symbology is among those in your application it will be shown in the image display with its code symbology name and a green box around it indicating it is decoded.



**NOTE:** The large green box for each symbol indicates the code localization area which by default is equal to the maximum FoV. It can be resized and moved by dragging its borders with the mouse. The code must be found within this area in order to be decoded.

2. Add your application specific codes to the Code Settings by selecting them from the icons over the Configuration Parameters tree area. If the Data Matrix symbology is not used, then delete it from the Code Settings with the  icon.

If you don't know the code type you can use the Code Autolearn feature by clicking on the  icon. See par. 4.4 for details.

3. For each code symbology set the relative parameters according to your application.

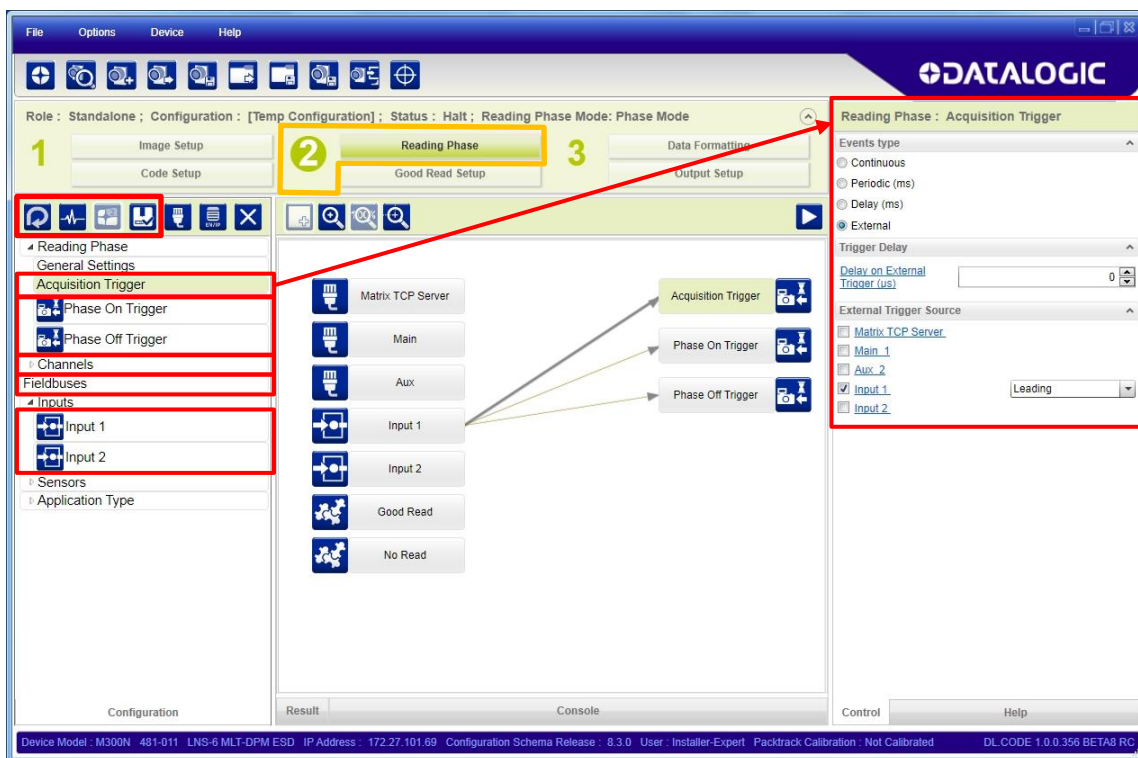
### 3.3 OPERATING MODE CONFIGURATION PARAMETERS

The Operating Mode Configuration parameters are divided into two groups: **Reading Phase** parameters and **Good Read Setup** parameters.



#### 3.3.1 Reading Phase

1. Select your application specific Operating Mode from the icons over the Configuration Parameters tree area: Continuous, One Shot, Phase Mode or PackTrack.

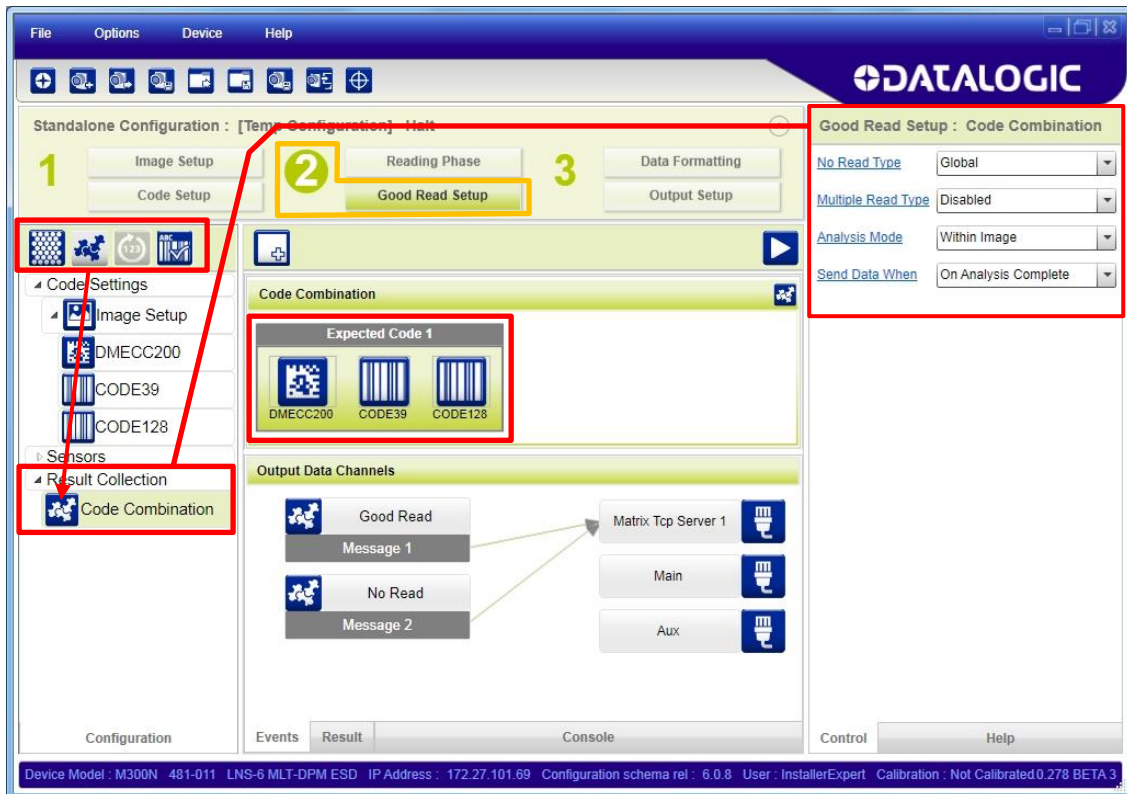



2. Configure the relative Operating Mode parameters from the Reading Phase parameters panel. Different groups will appear in the panel depending on the selected icons over the Configuration Parameters tree area.

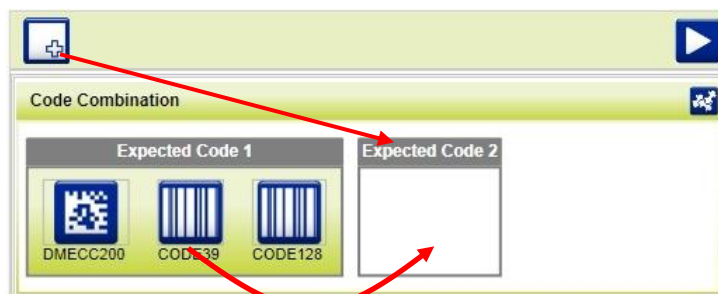
### 3.3.2 Good Read Setup

1. Select your specific data collection type from the icons over the Configuration Parameters tree area: Code Collection, Code Combination, Presentation or Match Code. Not all data collection types are available for all Operating Modes; for example PackTrack Operating Mode only supports Code Combination. Incompatible data collection types will be shown in grey and cannot be selected.

The following example shows Code Combination. By default, the Expected Codes are in OR, which means that any single decoded code will produce a Good Read condition independent from the other codes being decoded or not.



2. If all codes are required to be decoded to produce a Good Read condition, then they need to be combined in AND. To do this, create a new Expected Code box using the  icon. Then drag the Code icon from one box to the other.





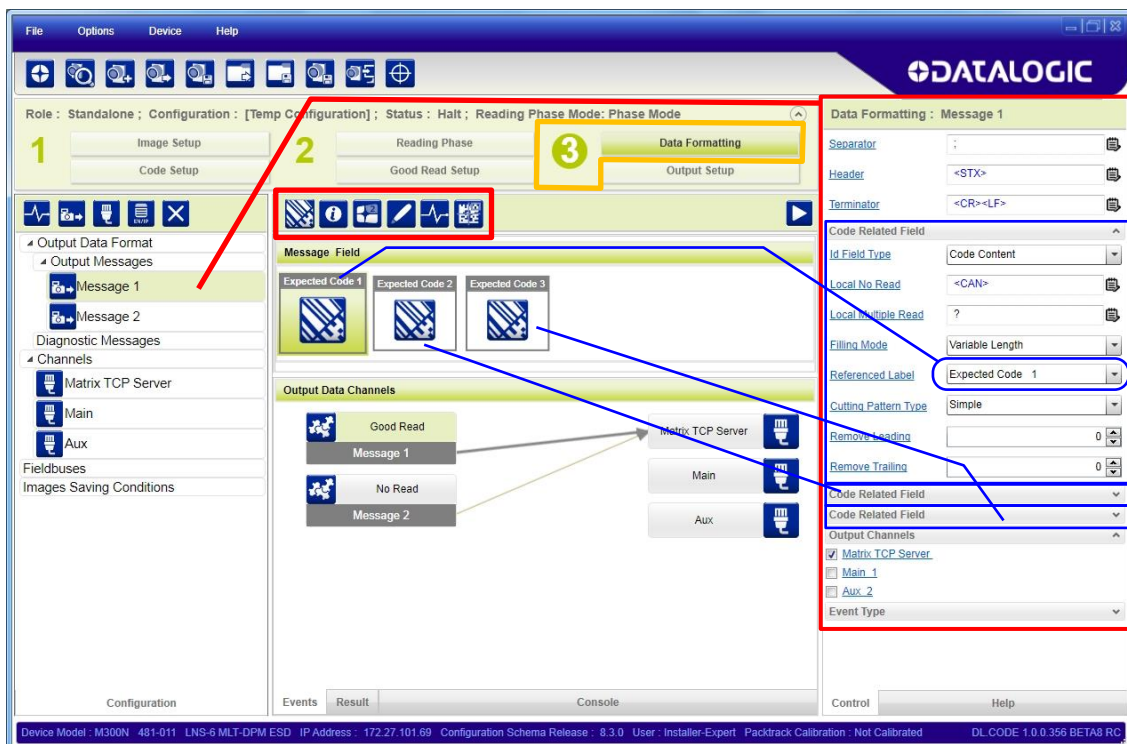
### 3.4 OUTPUT CONFIGURATION PARAMETERS

The Output Configuration parameters are divided into two groups: **Data Formatting** parameters and **Output Setup** parameters.



#### 3.4.1 Data Formatting

1. Configure your application specific Data Formatting Message(s) from the Configuration Parameters tree area: Message 1, Message 2, etc.



You can add fields to the output message by clicking on the icons above the Message Field area. They will be appended to the message. You can drag them to position them between other fields in the message so that the output message is ordered according to your application requirements.

Each field has its own relative configuration parameters in the parameters panel.

### 3.4.2 Output Setup

1. Configure your application specific Digital Output(s) and Green/Red Spots (if used) from the Configuration Parameters tree area: Output 1, Output 2, etc.



**NOTE:** Save the configuration from temporary memory to permanent memory, overwriting the previously saved configuration.



## 4 DL.CODE USER INTERFACE

### 4.1 DL.CODE DEVICE DISCOVERY WINDOW

After loading your specific device from the discovery window (drag & drop from the Device Selection Area), the DL.CODE Device Discovery window presents the following principal areas:

- **Main Menu and Toolbar Area** – allows access to the major program functions and commands. See par. 4.2.
- **Device List Area** – shows all the discovered devices both on and off the LAN. The colored icons next to the device labels indicate network status, see par. 4.1.1. Double-clicking or dragging an available device icon onto the Device Information Area connects it to DL.CODE for configuration.
- **Device Information Area** – this area shows all device specific information: Name, Model, Role, running software and version details.
- **Task Area** – Presents a graphical list of the main features to be performed upon device connection: create a new configuration (Stand Alone or Master/Slave), Open an existing configuration, perform PackTrack calibration, or switch to Monitor mode. These selections are also available in the File and Device Menus.
- **Control/Help Panel** – In the DL.CODE opening window this panel provides a Help description for Device Selection. Once a new or existing configuration is loaded, this is the key area which allows all the individual device configuration parameters to be set. Context sensitive Help is also available from this panel. See par. 4.1.2.
- **Status Bar** – a reserved area that keeps specific information about the connected device, SW schema revision, user level, calibration status, and program version always visible.

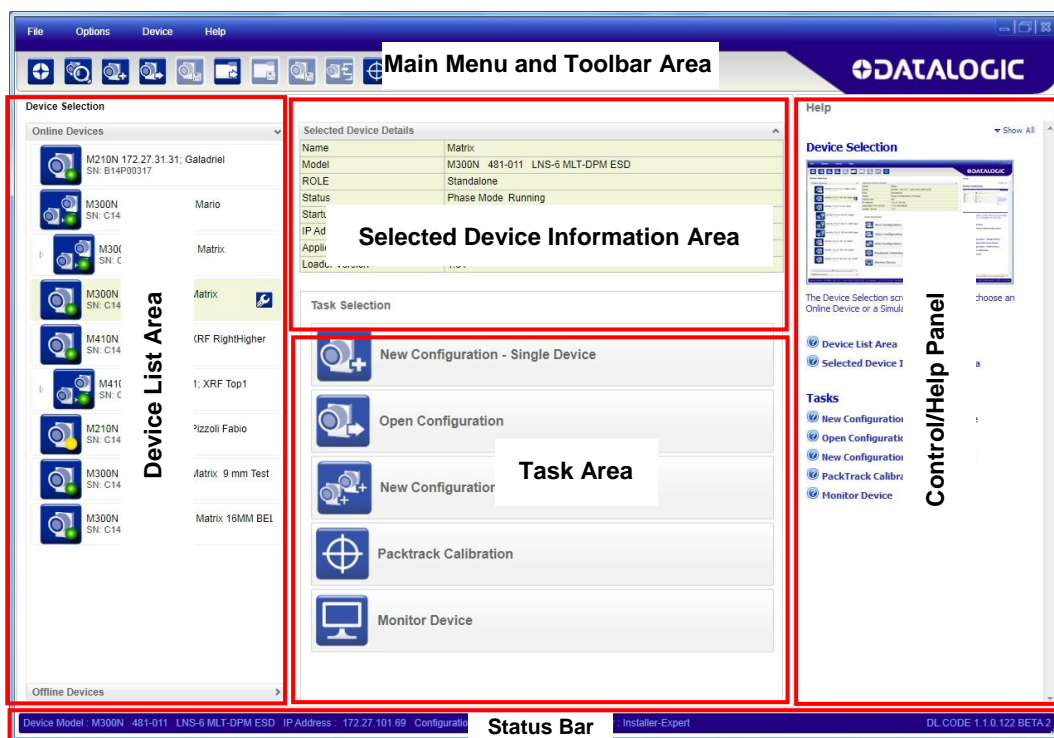








Figure 5 – Device Discovery Window Areas

### 4.1.1 Device List Area

The Device List area shows all the discovered devices both on and off the LAN. The icons indicate the Device status as shown in the table below:

	Stand Alone device connected to the network with a valid LAN IP address. Available for configuration through DL.CODE.
	Stand Alone device connected to the network with a valid LAN IP address but currently connected to DL.CODE by another User. Not available for configuration through DL.CODE (double-clicking or dragging the icon has no effect).
	Device connected to the network but without a valid LAN IP address (i.e. default IP address). The IP addressing parameters must be modified to connect to the LAN. See par. 3.1.
	Offline device deactivated. Only one offline device at a time can be activated.
	Master device connected to the network with a valid LAN IP address. Available for configuration through DL.CODE.

### 4.1.2 Control/Help Panel

Upon opening DL.CODE, the Device Selection Help Page is displayed with dropdown descriptions briefly explaining how to connect to your device and the various configuration selections. Click on the  icon to open the dropdown description.

Help

▼ Show All

**Device Selection**



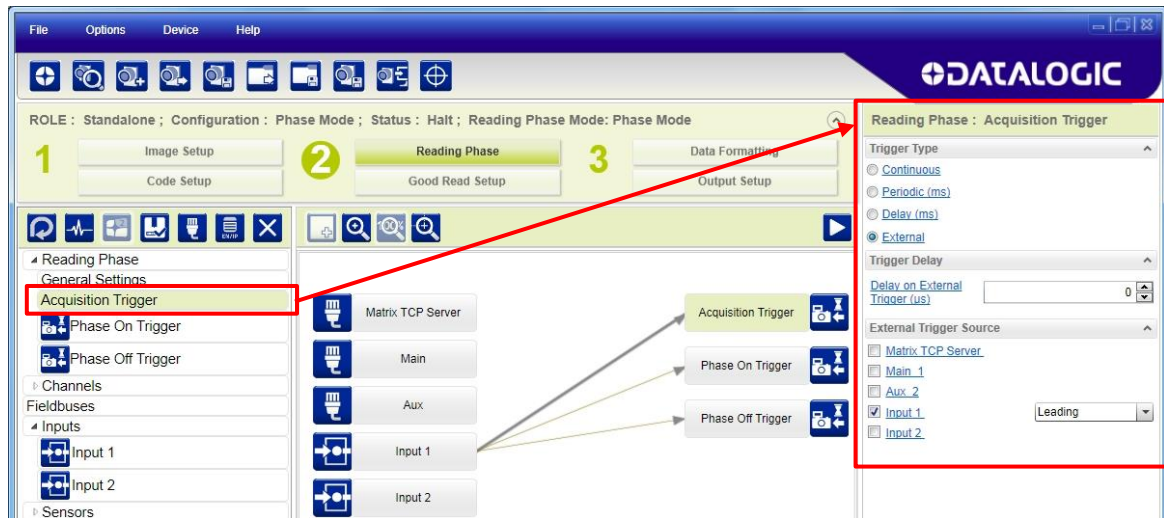
The Device Selection screen allows you to choose an Online Device or a Simulator to work with.

-  Device List Area
-  Selected Device Information Area

**Tasks**

-  New Configuration - Single Device
-  Open Configuration from Device
-  New Configuration - Multi Device
-  PackTrack Calibration
-  Monitor Device

When a new configuration is created or an existing one is opened, the Control page showing all of the configuration parameters for the selected configuration step or item is displayed in the Help/Control area.



By clicking on any parameter name with a hyperlink, the relative contextual help page will open and present the specific parameter description.

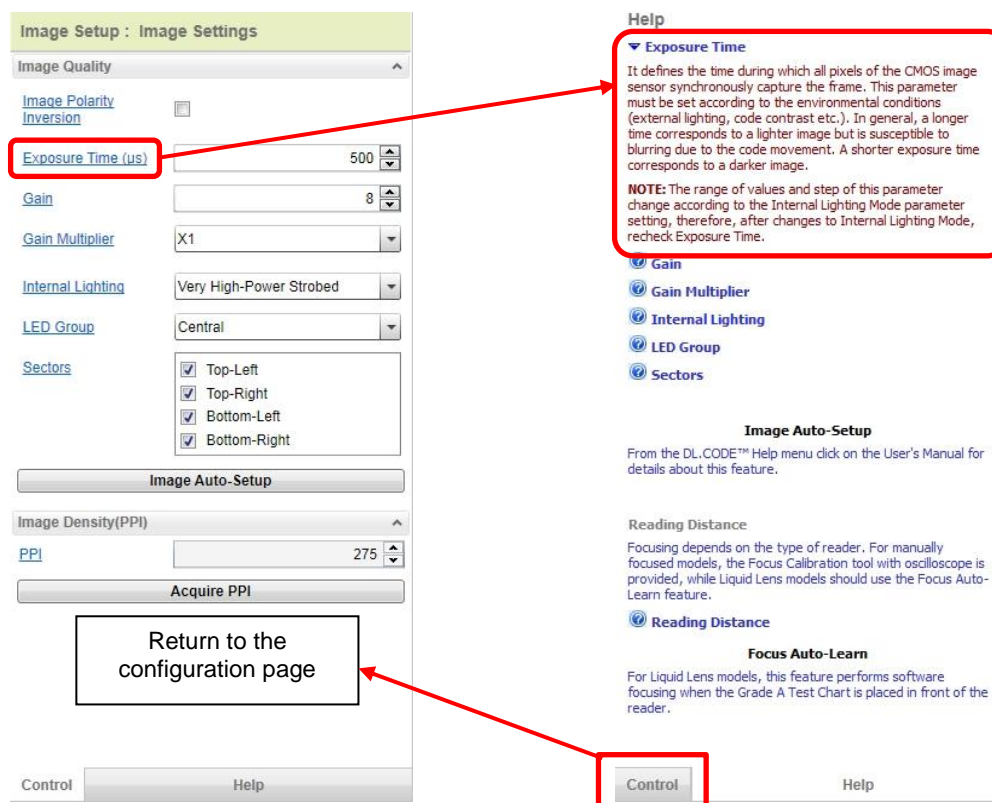


Figure 6 – Control Panel and Relative Contextual Help Page

To return to the parameter page, click on the **Control** bar.



## 4.2 DL.CODE MAIN MENU AND TOOLBAR

The Main Menu and Toolbar icons are located at the top of the DL.CODE window as shown below.



The Main Menu presents the following items:

### File:

- **Getting Started:** returns to the initial Device Discovery window to load a different device. You will be prompted to Save or Discard the current configuration.
- **Open:** load a previously saved configuration from the device memory or from a .dlcfg file selected from a disk/directory of your choice.
- **Save:** save the current configuration to the device memory or to a .dlcfg file selected from a disk/directory of your choice.
- **New:** Start a new Standalone or Master/Slave device configuration.
- **Monitor:** sets the device to run mode for testing configuration results. An image window is displayed along with Statistics, Diagnostics and a Console for output message verification. See par. 0 for details on using and configuring the Monitor.
- **Exit:** exits the DL.CODE User Interface.

### Options:

- **Change Language:** allows you to change the display language used for DL.CODE in real time. The selected language will also be used for successive sessions. This option will be made available in the future.
- **UI Settings:** opens a window where various settings regarding DL.CODE presentation on the PC. The following DL.CODE features can be configured: console presentation, Image Buffer positioning and behavior, Simulator Settings, and selecting which features to enable for viewing. The Monitor can also be configured from this window by selecting the Monitor tab.
- **Change Log Level:** allows the configuration log level to be changed between Verbose, Information and Error.
- **Change User:** allows the configuration access level to be changed between Basic-User (no parameters modification allowed), Basic-Installer (medium level of parameter modification allowed) and Expert-Installer (maximum level of parameter modification allowed).

### Device:











- **Connect to Device:** if not already connected to a device, this allows you to connect to a device on the LAN by inputting its IP Address into the dialog box and clicking Connect.
- **Find Devices:** searches for new devices connected to the LAN without disconnecting from the current device.

- **Settings:** opens device configuration windows for configuring Environment parameters (see chp. 12), Advanced Configuration Settings, resetting Statistics and/or Diagnostic counters and viewing HMP shortcuts.
- **Update Package:** allows updating the device firmware (application program, schema, etc.)
- **Change Current Configuration:**
- **Restart Device:** performs a software reset on the loaded device.
- **Backup/Restore:** manages all the backup and restore options to and from the device as well as restoring the default settings.
- **RAM Image Buffer Settings:** opens the RAM Image Buffer Management window to either save or discard images in the device's RAM Image Buffer.
- **PackTrack Calibration:** launches the Packtrack Calibration procedure. See chapter 10 for details.

#### Help:

- **About:** opens the information window containing the DL.CODE program release version number.
- **User'sManual:** opens this manual.

#### Toolbar buttons:

	Getting Started: Disconnects the current device and returns to the Device Discovery window. If the current configuration hasn't been saved you will be prompted to do so before disconnecting.
	Find Devices: Executes a device discovery to find new or modified devices on the LAN without disconnecting from the current device.
	New Stand Alone Configuration: starts a new default configuration which can be modified and saved. You must save the configuration with a new name or overwrite an existing one. You cannot overwrite the default configuration.
	Open from Device: Open a previously saved configuration from the device memory.
	Save on Device: Save the current configuration to the device.
	Load from PC: Open a previously saved .dlcfg configuration file from the local PC or to a remote network location.
	Save on PC: Save the current configuration to a .dlcfg file on the local PC or to a remote network location.
	Save Configuration in Temporary Memory:
	Configuration/Monitor Switch: toggles between the Configuration environment and the Monitor environment. See chp. 7 for details.
	PackTrack Calibration: starts the PackTrack Calibration feature. See chapter 10.

### 4.2.1 User Levels

DL.CODE has a 3-level user interface (**Basic User** level, **Basic Installer** level, **Expert Installer** level).

Each level can be accessed by selecting it from the Options Menu.

The User levels have the following access rights.

**Basic User:** only access to the Monitor feature is given. No device configuration.

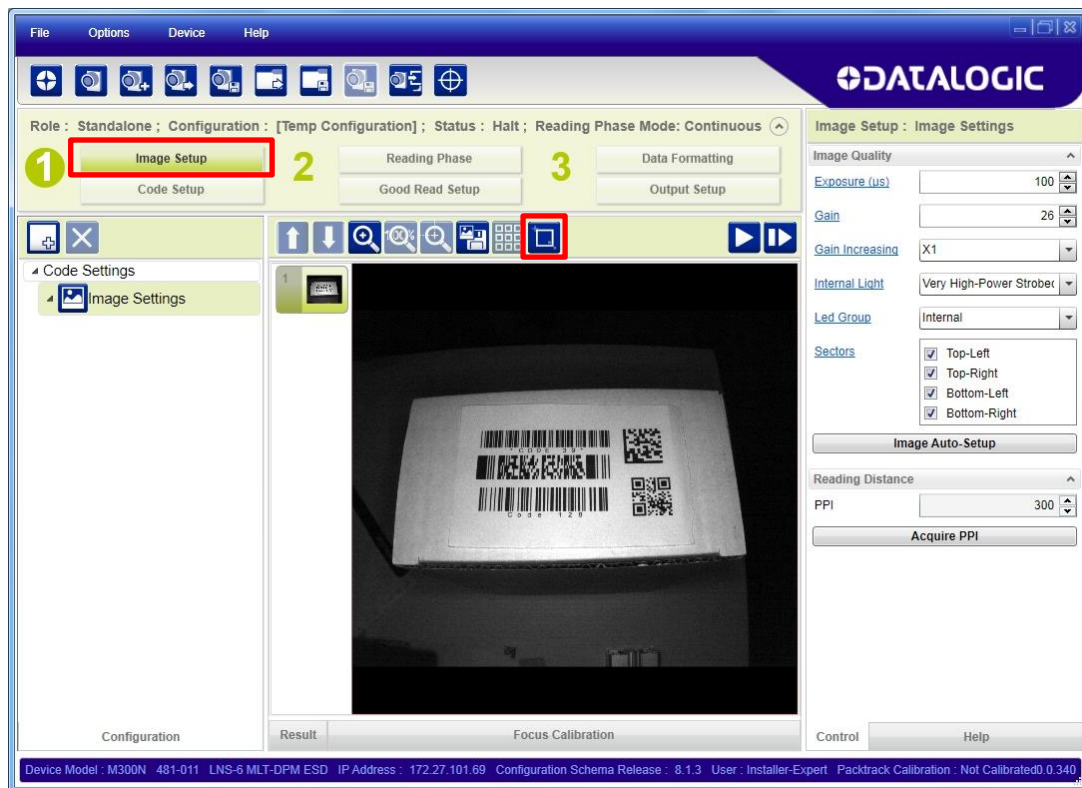
**Basic Installer:** a subset of program features and configuration parameters is allowed. No Master/Slave configuration, no multiple Image Setup configuration, no Postal Codes configuration, no Code Filter configuration, no Fieldbus configuration.

**Expert Installer:** access is given to all program features and configuration parameters.

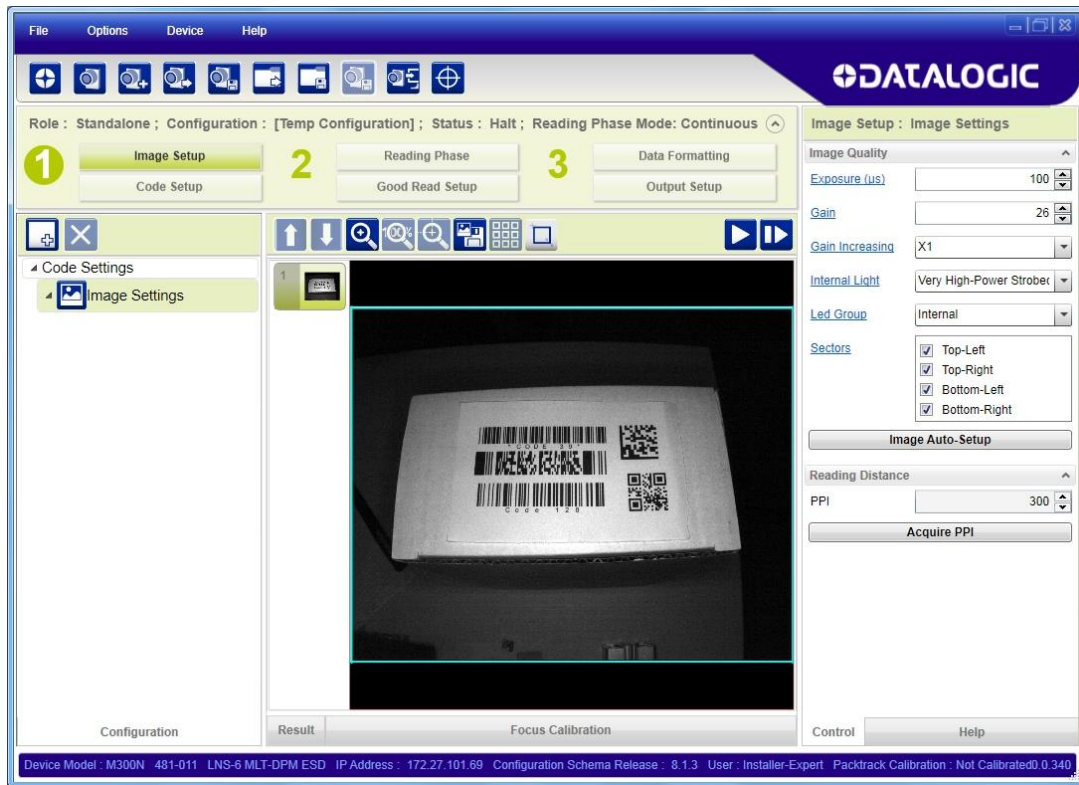
### 4.3 IMAGE CROPPING

In some applications, the Image Cropping feature in DL.CODE can help to increase decoding and result performance. Image cropping is performed from the Image Setup tab by clicking on the Add Cropping Region icon as shown below.

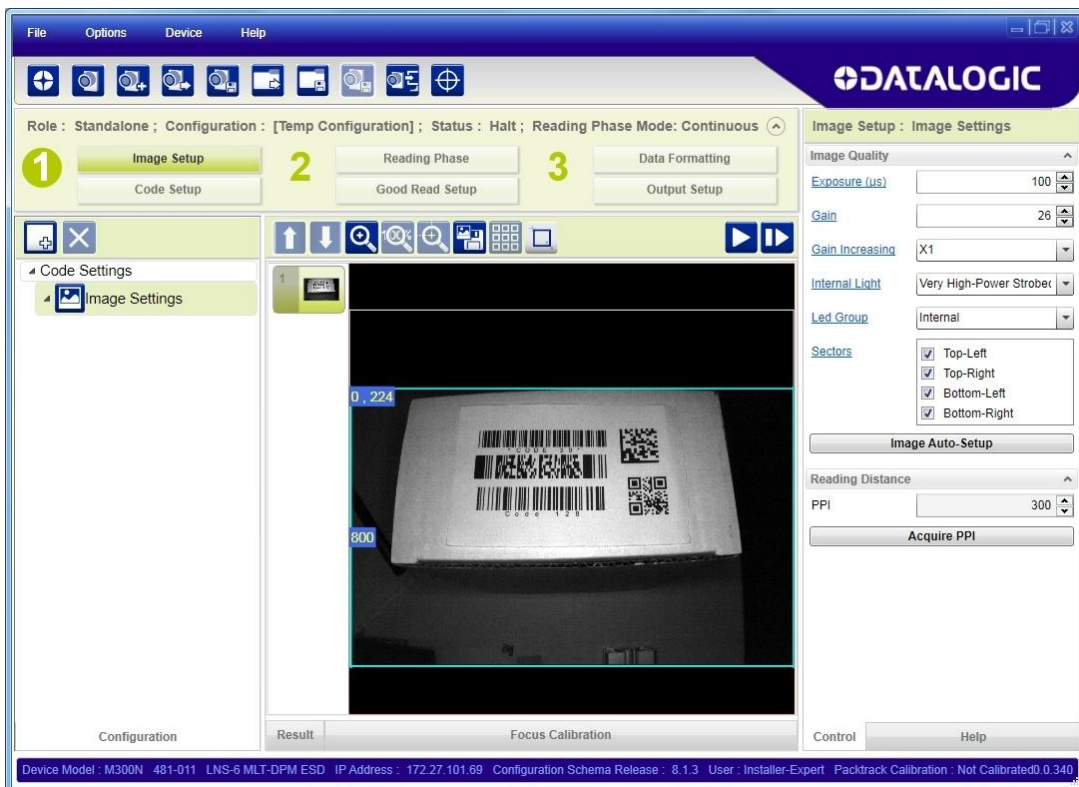
Image cropping allows reducing the Image processing area from the full FoV to a smaller area where codes are present. By excluding portions of the FoV, processing time is reduced.



After clicking the Add Cropping Region icon, a blue border appears which by default is equal to the FoV.



By dragging the edges with the mouse (resizing) you can crop the image to a specific location where codes are present.



The cropped area can also be moved by dragging the center.

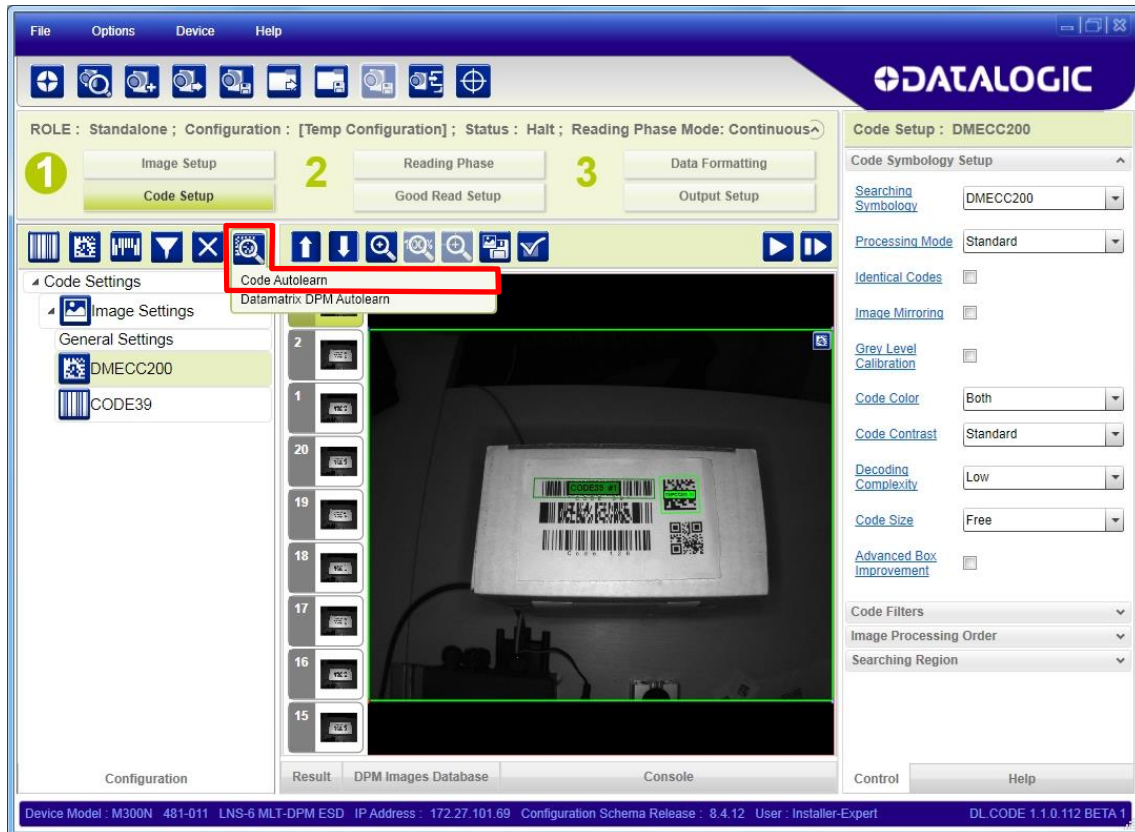




## 4.4 CODE AUTOLEARN FEATURE

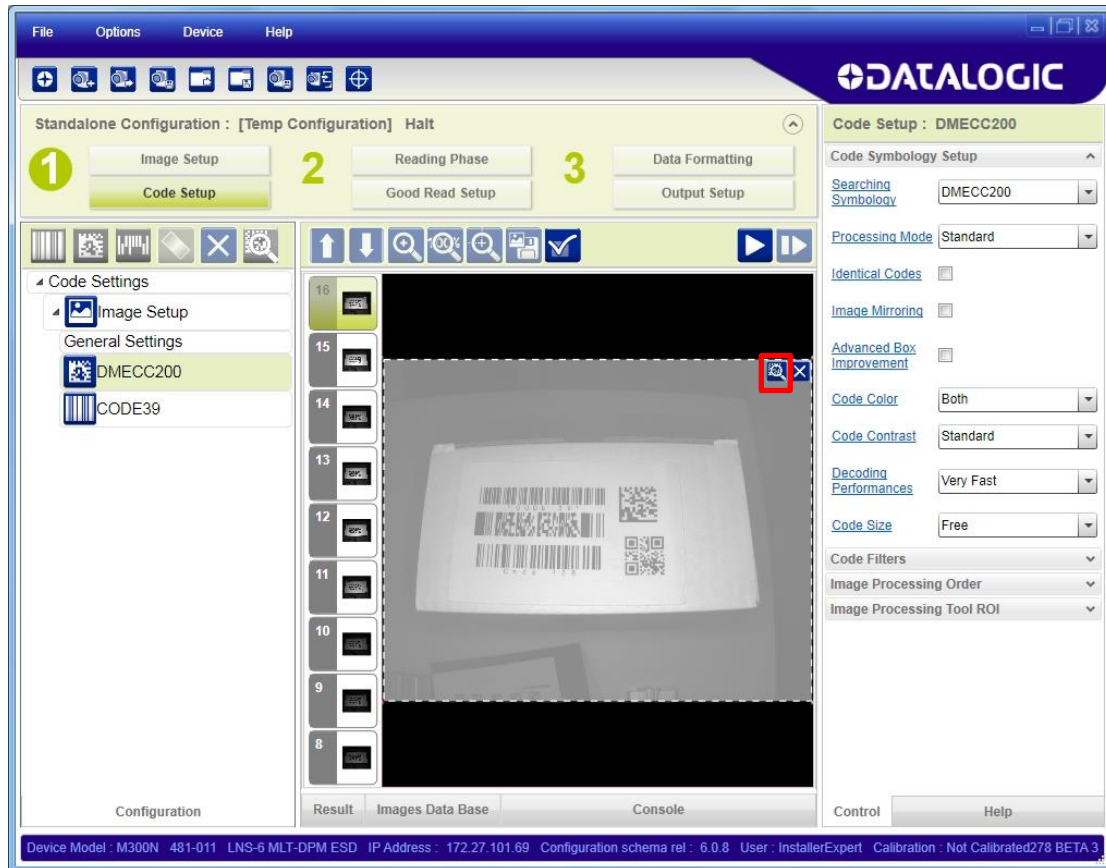
From the Code setup page you can run the Code Autolearn feature which will locate all the codes present in the captured image.

1. From the Code Setup Page click on the Autolearn icon and select Code Autolearn.



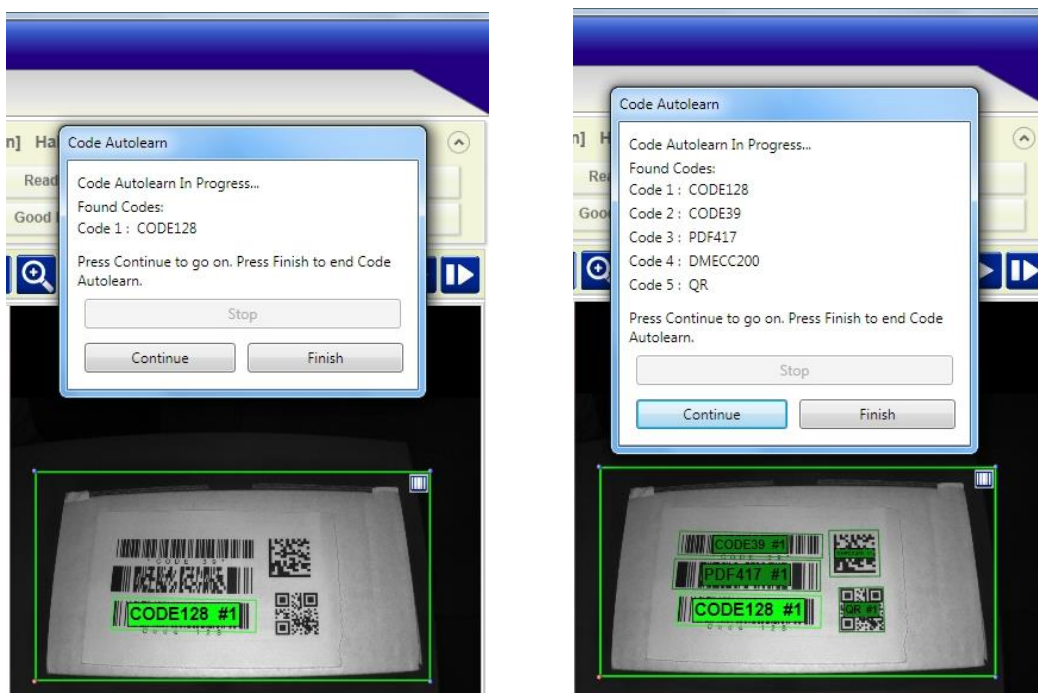
The Autolearn region (equal to the FoV) is shown in grey. You can reduce and/or move the search area by dragging the borders or the center of the area with the mouse.

- Reducing the area can reduce the time necessary to find the code(s).
- Moving the search area allows finding specific code(s) in the image.

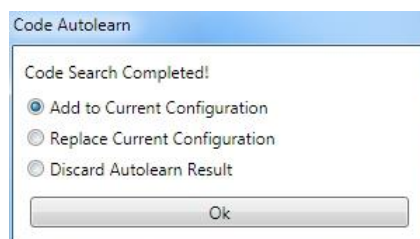


- Whether the area is reduced or not, you can start the Autolearn feature by clicking on the Autolearn icon in the display area.

Each autolearn iteration locates a single code symbology and you will be prompted to Continue (if you need to find other codes) or to Finish.



3. When you have located all the code symbologies, click on Finish. You will be prompted to choose a saving selection.



## 4.5 DPM AUTOLEARN FEATURE

See chapter 11.



## 4.6 CODE FILTERING

Code Filtering is typically done in DPM applications where the marking technique produces module shapes or textures that can make decoding difficult. Special DPM algorithms are provided to improve decoding as well as pre-processing Code Filters which modify the image to compensate for defects.

The following paragraphs detail the DPM parameters used to enhance decoding capabilities.

### 4.6.1 DPM Algorithms

For **Data Matrix** family codes the **Decoding Complexity** parameter is available when Processing Mode is set to Standard and selects the decoding algorithm according to the printing/marking technique used to create the symbol and on the overall printing/marking quality.

The possible selections progress from Low to Very High where Low can improve decoding time for good print/mark quality and/or relatively normal size codes. This is the default setting. Very High can improve the decode rate for low print/mark quality and/or small size codes. This algorithm is much more aggressive but in general it may have longer decoding times than the lower complexity algorithms. **To minimize decoding time it is better to select the lowest value that still guarantees good decoding.**



Washed out and Axial Distortion



Dot Peening On Scratched Surface



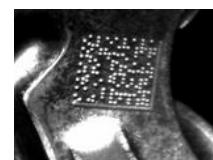
Low Contrast Problem



Background Problems



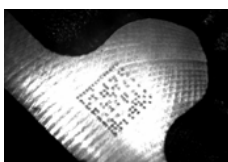
Marked On Curved Shiny Surface



Axial distortion



Half moon effects



Shiny surface, noisy background



Low contrast, noisy background

Figure 7 – Problematic Direct Part Marking Examples

For **QR** code the **Decoding Method** parameter allows the Dot Peen Decoding algorithm to be selected which improves the decode rate for low quality Direct Part Mark codes and in general for Direct Part Mark codes with dot peening type module shapes.

### 4.6.2 Code Filters

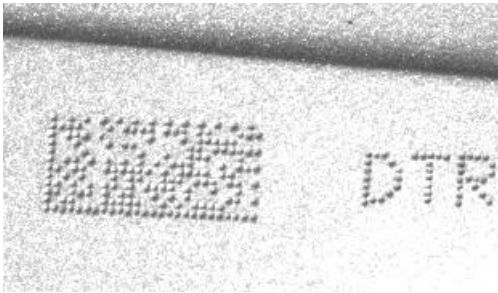
The following Code Filters can be applied to DPM codes to improve decoding.

#### Image Filter

Sets the filter to be applied to the image before being processed. This parameter can be used to successfully decode particular ink-spread printed codes (ex. direct part mark codes).

A different filter can be applied to each **Image Acquisition Setup**.

The **Erode** Filter enlarges the image dark zones to increase readability.



Before - No Read



After - Readable

#### Erode

The **Dilate** Filter enlarges the image white zones to increase readability.



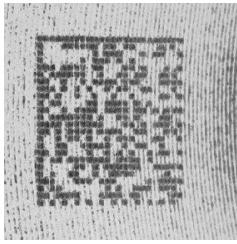
Before - No Read



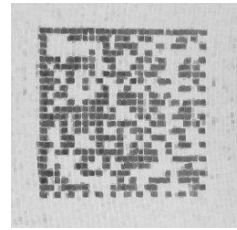
After - Readable

#### Dilate

The **Close** filter eliminates dark areas (defects) in the white zones of the image.



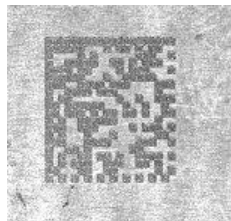
Before - No Read



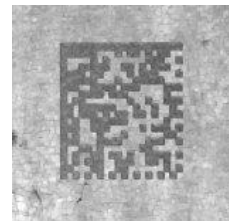
After - Readable

### Close

The **Open** filter eliminates white areas (defects) in the dark zones of the image.



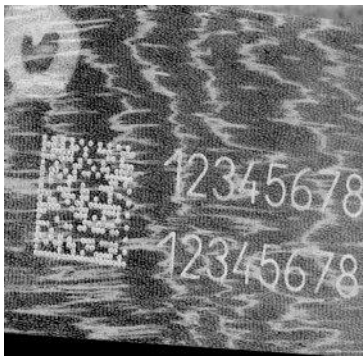
Before - No Read



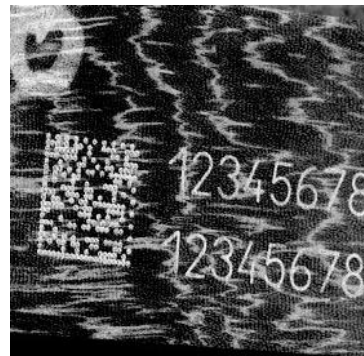
After - Readable

### Open

The **Contrast Stretching** filter maximizes image contrast.



Before - No Read



After - Readable

### Contrast Stretching

The ***Histogram Equalization*** filter makes the gray level distribution uniform.



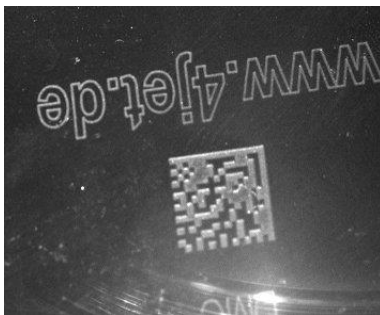
Before - No Read



After - Readable

### Histogram Equalization

The ***Smoothing*** filter deletes small (insignificant) details in the center of the image.



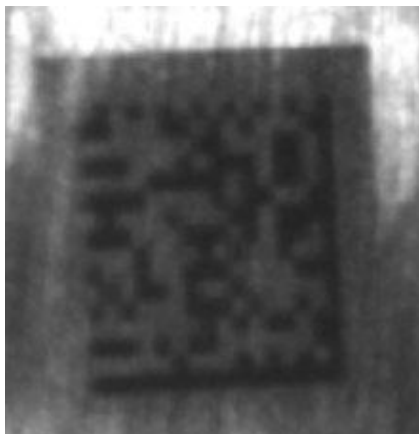
Before - No Read



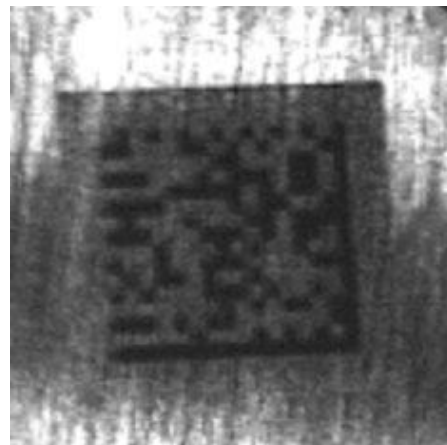
After - Readable

### Smoothing

The ***Sharpening*** filter improves out of focus images.



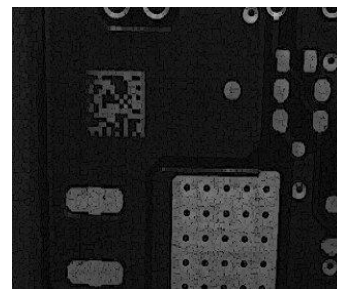
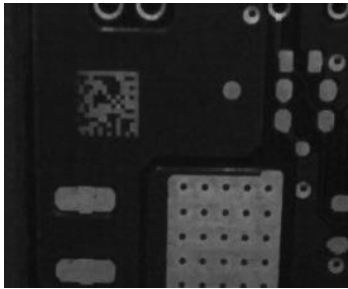
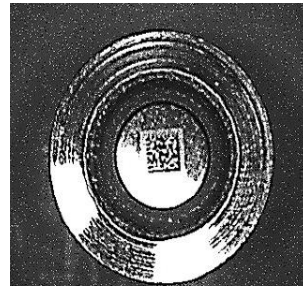
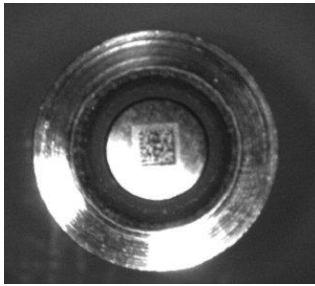
Before - No Read



After - Readable

### Sharpening

The **Deblurring** filter improves blurred images.

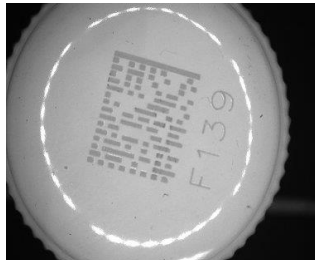


Before - No Read

After - Readable

### Deblurring

The **Black Enhancement** filter produces a nonlinear increase in the black level for light images.

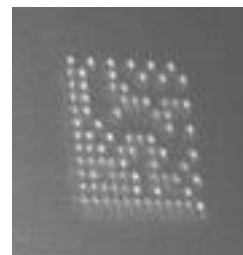


Before - No Read

After - Readable

### Black Enhancement

The **White Enhancement** filter produces a nonlinear increase in the white level for dark images.



Before - No Read

After - Readable

### White Enhancement

## 4.7 SOFTWARE RESET

At any time the device can be reset by the Restart Device command () in the DL.CODE Device Menu.



**CAUTION:** Remember to save the current configuration before restarting.

## 5 DATA COLLECTION METHODS

### 5.1 CODE COLLECTION

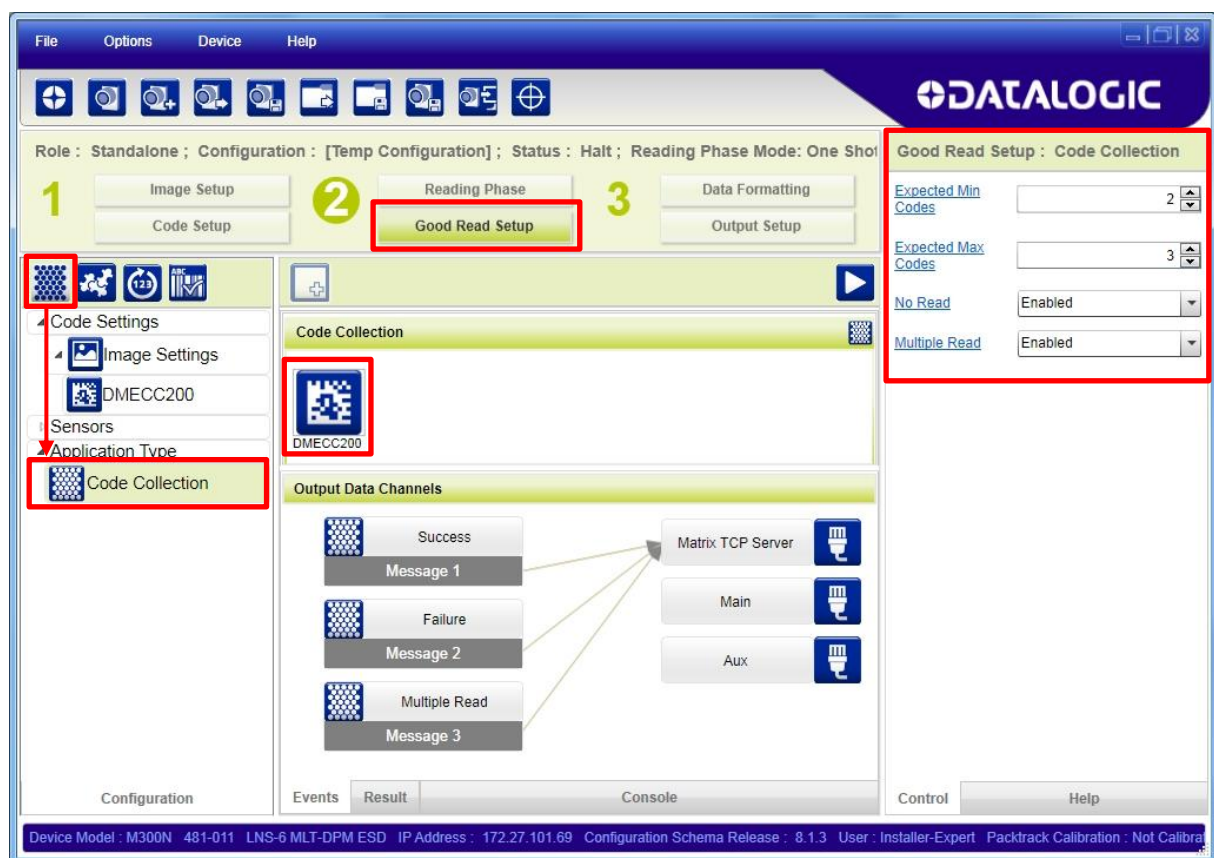
Valid Operating Modes: Continuous, One Shot, Phase Mode

In Code Collection mode the reader can collect several codes before providing a single output result.

The number of codes to be collected is set by the *Expected Min Codes* and *Expected Max Codes*.

The type of output message sent to the host depends on the *No Read* and *Multiple Read* parameter settings and can be modified and formatted in the Data Formatting Output Group.

**Example:**



As shown in the figure above, the following parameters are set:

The DMECC200 code type is enabled and present in the Code Collection.

Expected Min Codes = 2; Expected Max Codes = 3; No Read is Enabled; Multiple Read is Enabled

Case 1: two or three DMECC200 codes are read

Output: the content of **Message 1 Success** is sent to the Host. This corresponds to a Good Read message and by default contains the code content.



Case 2: one DMECC200 code is read

Output: the content of **Message 2 Failure** is sent to the Host. This corresponds to the No Read message because it doesn't satisfy the expected minimum codes criteria.

Case 3: four DMECC200 codes are read

Output: the content of **Message 3 Multiple Read** is sent to the Host. This corresponds to the Multiple Read message because it exceeds the expected maximum codes criteria.

If the Multiple Read parameter is Disabled, then Case 3 is considered a Good Read and the content of **Message 1 Success** is sent to the Host containing the first three decoded codes.

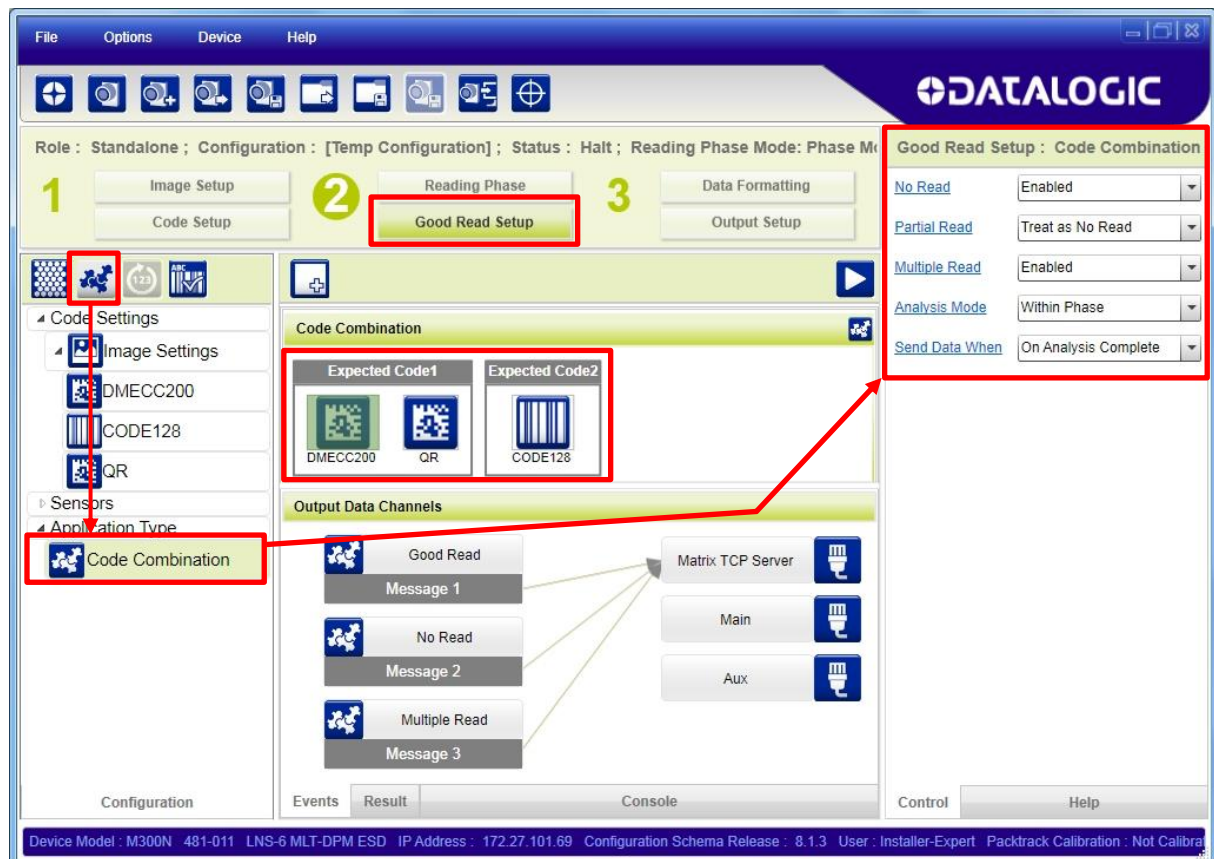
In Phase Mode, by setting **Analysis** to *Within Phase* only the reading phase is considered and a single result is provided to the user for each phase. On the other hand, by selecting *Within An Image* the reader searches for the defined number of codes within each acquired image and a result is provided to the user after each image decoding.

## 5.2 CODE COMBINATION

Valid Operating Modes: Continuous, One Shot, Phase Mode, PackTrack

In Code Combination mode the output results sent to the Host depend not only on the codes read but on meeting their configured logical combination criteria.

**Example:**





As shown in the figure above, the following parameters are set:

The DMECC200, QR Code and Code128 types are enabled and present in the Code Combination with the following logical combination:

DMECC200 OR QRCode AND Code128.

No Read is Enabled; Multiple Read is Enabled; Partial Read is treated as No Read

Case 1: codes (DMECC200 AND Code128) or (QR Code AND Code128) are read

Output: the content of **Message 1 Good Read** is sent to the Host. This message by default contains the code content.

Case 2: only one of the three codes (DMECC200, QR Code or Code128) is read

Output: this is a Partial Read which, in this example, is treated as a No Read. The content of **Message 2 No Read** is sent to the Host.

Case 3: all three codes (DMECC200, QR Code and Code128) or (only DMECC200 and QR Code) are read

Output: the content of **Message 3 Multiple Read** is sent to the Host.

If the Multiple Read parameter is Disabled, then for Case 3:

- all three codes read (DMECC200, QR Code and Code128), is considered a Good Read and the content of **Message 1 Good Read** is sent to the Host containing one of the 2D codes (whichever was decoded first) AND Code128.
- reading (only DMECC200 and QR Code), is considered a Partial Read which, in this example, is treated as a No Read and the content of **Message 2 No Read** is sent to the Host.

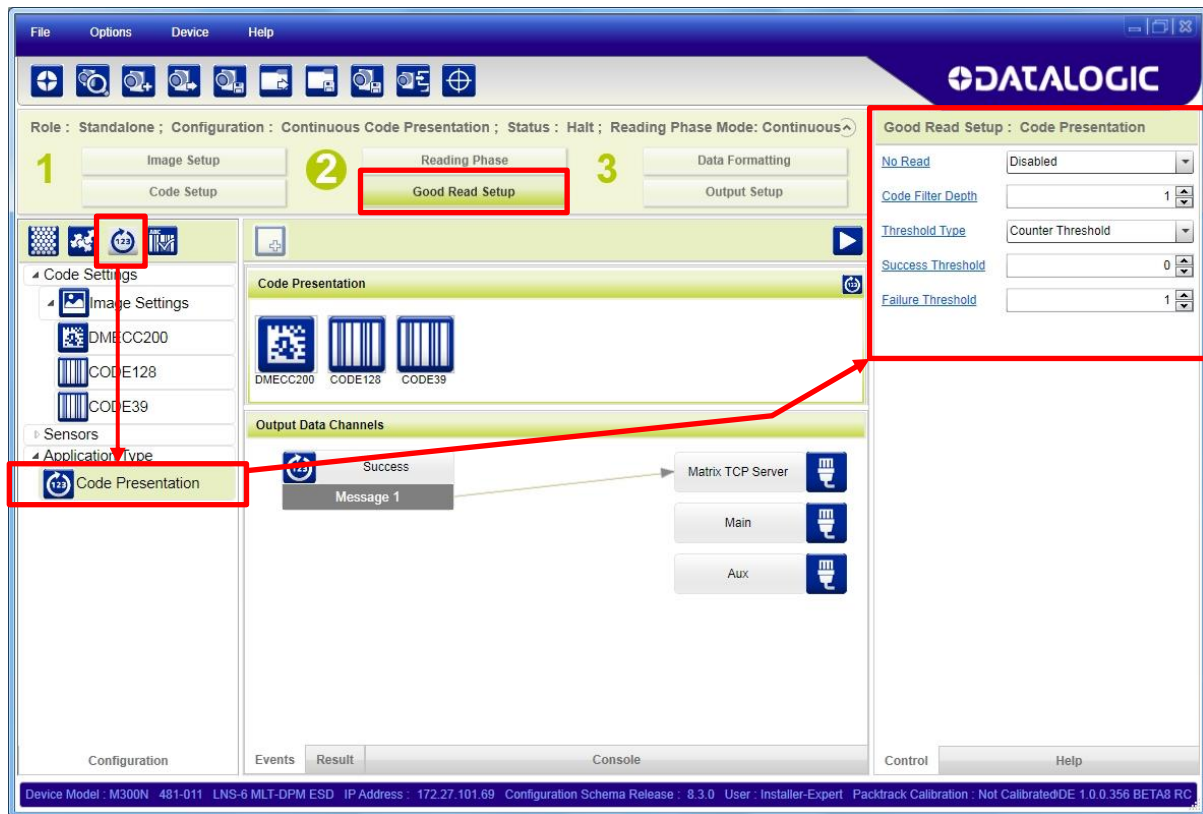
In Phase Mode, by setting **Analysis** to *Within Phase* only the reading phase is considered and a single result is provided to the user for each phase. On the other hand, by selecting *Within An Image* the reader searches for the defined combination of codes within each acquired image and a result is provided to the user after each image decoding.

## 5.3 CODE PRESENTATION

Valid Operating Modes: Continuous, One Shot

In Code Presentation mode typically a code is placed in front of the reader manually and the successful output results are sent to the Host. Usually No Reads are disabled and the configuration should correctly manage Multiple Reads.

**Example:**



As shown in the figure above, the following parameters are set:

The DMECC200, Code128 and Code39 types are enabled and present in the Code Presentation:

No Read is Disabled; Code Filter Depth is 1, and multiple reads are handled by the Acquisition Counter Threshold: Success Threshold=0, Failure Threshold=1.

Case 1: any code or combination of codes (of the enabled code types) is read in a single acquisition.

Output: the content of **Message 1 Success** is sent to the Host containing one occurrence of all of the decoded codes. This message by default contains the code content.

Case 2: any code or combination of codes is presented to the reader repeatedly

Output: this is a multiple read condition which is managed as follows:

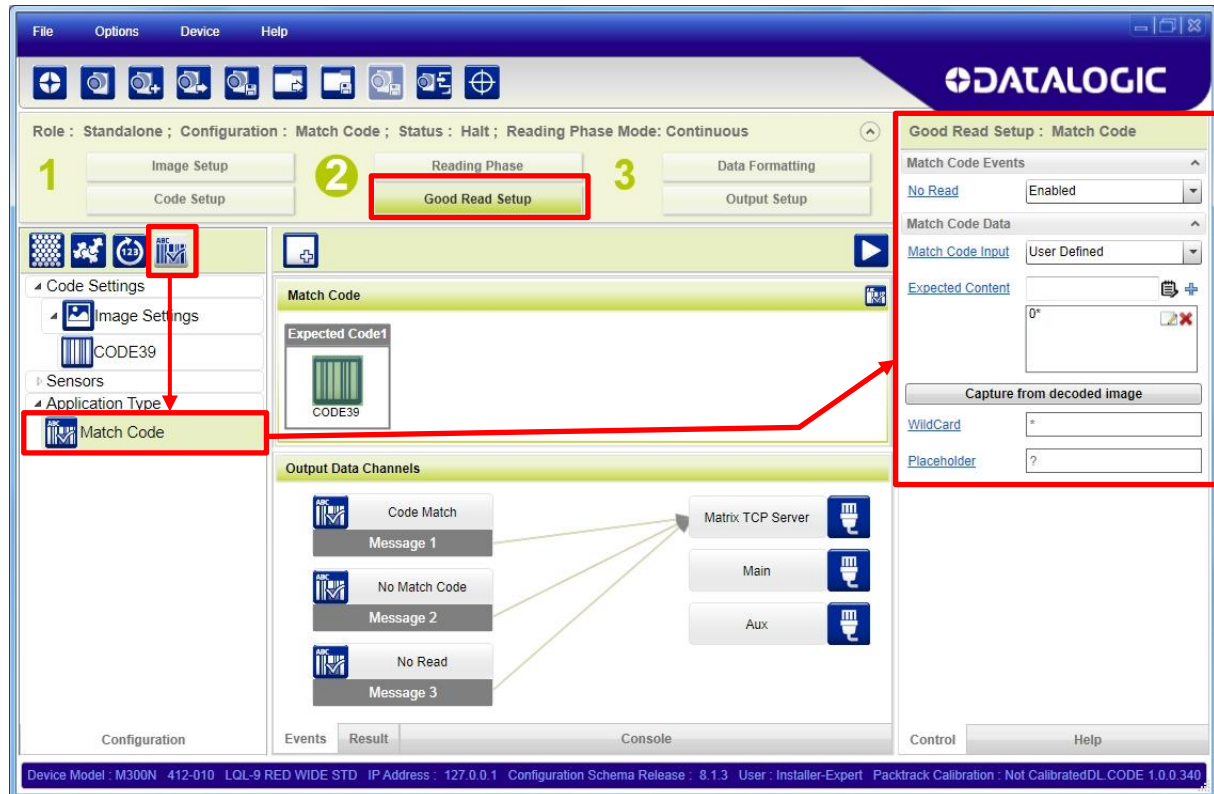
- Success Threshold=0, the same code (by content and type) cannot be read in successive acquisitions.
- Failure Threshold=1, the same code (by content and type) can only be read after at least 1 acquisition without a code.

## 5.4 MATCH CODE

Valid Operating Modes: Continuous, One Shot, Phase Mode

In Match Code mode the output results sent to the Host depend on whether the codes read meet the match code criteria or not.

**Example:**



As shown in the figure above, the following parameters are set:

Code39 type is enabled and present in the Match Code:

No Read is Enabled; Match Code Input is User Defined where the Expected Content = "0\*" (all codes must begin with zero but can be followed by any string – wildcard).

Case 1: a Code39 type is read and its content begins with 0 (zero).

Output: the content of **Message 1 Code Match** is sent to the Host. This message by default contains the code content.

Case 2: a Code39 type is read but its content does not begin with 0 (zero).

Output: the content of **Message 2 No Match Code** is sent to the Host.

Case 3: no Code39 type is read.

Output: the content of **Message 3 No Read** is sent to the Host.

## 6 MESSAGE FORMATTING

Message Formatting is extremely flexible to allow a high level of customization depending on the application requirements.







This however makes formatting more complex, so here we will break down the main characteristics.

Information relative to code reading is transmitted in standard formats on the device's selected interface. We refer to this as the OUTPUT MESSAGE.

The general format of the OUTPUT MESSAGE is:

**<HEADER><RESULTS><TERMINATOR>**

The RESULTS component is composed of several optional fields which are used in different combinations to create different output messages (like Successful Read, No Read, Statistical Data, Diagnostic Data, etc.). These fields can be inserted into the output message in any order. A list of the formatting fields is given in the table below.

Fields	Icon	Meaning
Code Related		Report various code related information types in the output message: Code Content, Number of Characters, Code Symbology, Pixels Per Element, Average Module Size (mils), Symbol Size, Decoding Time, X-Coordinate, Y-Coordinate, Angle, Slave Number, Bounding Box.  Each Code Related field can only contain one information type, but you can include multiple Code Related fields in the output message.
Global Statistics		Include Global Statistical Counters in the output message.
Global Reading		This field offers different types of information depending on the data collection Analysis Mode and on the Operating Mode. <ul style="list-style-type: none"> <li>When analyzing within an image, the Image Processing Time can be included in the output message to monitor performance. Typically used for Troubleshooting or fine tuning during installation.</li> <li>For Phase mode, several phase related counters are available.</li> <li>For PackTrack mode you can add the Pack ID to the output message.</li> </ul>
Custom		Define custom strings to be included in the output message. Typically used to customize Failure messages like No Read or Multiple Read.
Diagnostics		Monitor individual Diagnostic Failure events by including them in the output message. Typically used for Troubleshooting.  These can also be included independently from the Code Reading events by defining them in the Diagnostic Message. In this case they will be sent at regular intervals depending on the defined timeout.
Code Quality Grading		Include code quality trending to monitor print quality of code labels.

## 6.1 FIELD LENGTH MANAGEMENT

All field types by default are Variable Length fields but they also support Fixed Lengths with cutting and filling mode options.

<a href="#">Filling Mode</a>	Fixed Length
<a href="#">Length</a>	20
<a href="#">Filling Pattern</a>	
<a href="#">Field Justification</a>	Left Aligned
<a href="#">Referenced Label</a>	Expected Code 1
<a href="#">Cutting Pattern Type</a>	Pattern
<a href="#">Pattern Cutting Mode</a>	Keep Before
<a href="#">Pattern String</a>	<CAN>

## 6.2 INPUT STRINGS

All Input String fields have a table icon to the right of the field which allows you to input all ASCII characters including non-printable characters.

Table

<NUL>	00	<Space>	20	@	40	`	60	<80>	80	<A0>	A0	<C0>	C0	<E0>	E0
<SOH>	01	!	21	A	41	a	61	<81>	81	<A1>	A1	<C1>	C1	<E1>	E1
<STX>	02	"	22	B	42	b	62	<82>	82	<A2>	A2	<C2>	C2	<E2>	E2
<ETX>	03	#	23	C	43	c	63	<83>	83	<A3>	A3	<C3>	C3	<E3>	E3
<EOT>	04	\$	24	D	44	d	64	<84>	84	<A4>	A4	<C4>	C4	<E4>	E4
<ENQ>	05	%	25	E	45	e	65	<85>	85	<A5>	A5	<C5>	C5	<E5>	E5
<ACK>	06	&	26	F	46	f	66	<86>	86	<A6>	A6	<C6>	C6	<E6>	E6
<BEL>	07	'	27	G	47	g	67	<87>	87	<A7>	A7	<C7>	C7	<E7>	E7
<BS>	08	(	28	H	48	h	68	<88>	88	<A8>	A8	<C8>	C8	<E8>	E8
<TAB>	09	)	29	I	49	i	69	<89>	89	<A9>	A9	<C9>	C9	<E9>	E9
<LF>	0A	*	2A	J	4A	j	6A	<8A>	8A	<AA>	AA	<CA>	CA	<EA>	EA
<VT>	0B	+	2B	K	4B	k	6B	<8B>	8B	<AB>	AB	<CB>	CB	<EB>	EB
<FF>	0C	,	2C	L	4C	l	6C	<8C>	8C	<AC>	AC	<CC>	CC	<EC>	EC
<CR>	0D	-	2D	M	4D	m	6D	<8D>	8D	<AD>	AD	<CD>	CD	<ED>	ED
<SO>	0E	.	2E	N	4E	n	6E	<8E>	8E	<AE>	AE	<CE>	CE	<EE>	EE
<SI>	0F	/	2F	O	4F	o	6F	<8F>	8F	<AF>	AF	<CF>	CF	<EF>	EF
<DLE>	10	0	30	P	50	p	70	<90>	90	<B0>	B0	<D0>	D0	<F0>	F0
<DC1>	11	1	31	Q	51	q	71	<91>	91	<B1>	B1	<D1>	D1	<F1>	F1
<DC2>	12	2	32	R	52	r	72	<92>	92	<B2>	B2	<D2>	D2	<F2>	F2
<DC3>	13	3	33	S	53	s	73	<93>	93	<B3>	B3	<D3>	D3	<F3>	F3
<DC4>	14	4	34	T	54	t	74	<94>	94	<B4>	B4	<D4>	D4	<F4>	F4
<NAK>	15	5	35	U	55	u	75	<95>	95	<B5>	B5	<D5>	D5	<F5>	F5
<SYN>	16	6	36	V	56	v	76	<96>	96	<B6>	B6	<D6>	D6	<F6>	F6
<ETB>	17	7	37	W	57	w	77	<97>	97	<B7>	B7	<D7>	D7	<F7>	F7
<CAN>	18	8	38	X	58	x	78	<98>	98	<B8>	B8	<D8>	D8	<F8>	F8
<EM>	19	9	39	Y	59	y	79	<99>	99	<B9>	B9	<D9>	D9	<F9>	F9
<SUB>	1A	:	3A	Z	5A	z	7A	<9A>	9A	<BA>	BA	<DA>	DA	<FA>	FA
<ESC>	1B	[	3B	[	5B	[	7B	<9B>	9B	<BB>	BB	<DB>	DB	<FB>	FB
<FS>	1C	\	3C	\	5C	\	7C	<9C>	9C	<BC>	BC	<DC>	DC	<FC>	FC
<GS>	1D	=	3D	=	5D	=	7D	<9D>	9D	<BD>	BD	<DD>	DD	<FD>	FD
<RS>	1E	>	3E	>	5E	>	7E	<9E>	9E	<BE>	BE	<DE>	DE	<FE>	FE
<US>	1F	?	3F	?	5F	?	7F	<9F>	9F	<BF>	BF	<DF>	DF	<FF>	FF

Just single-click on the desired character to insert it into the string.

While it is quicker to type normal characters directly from your keyboard, non-printable characters must be entered using the table.

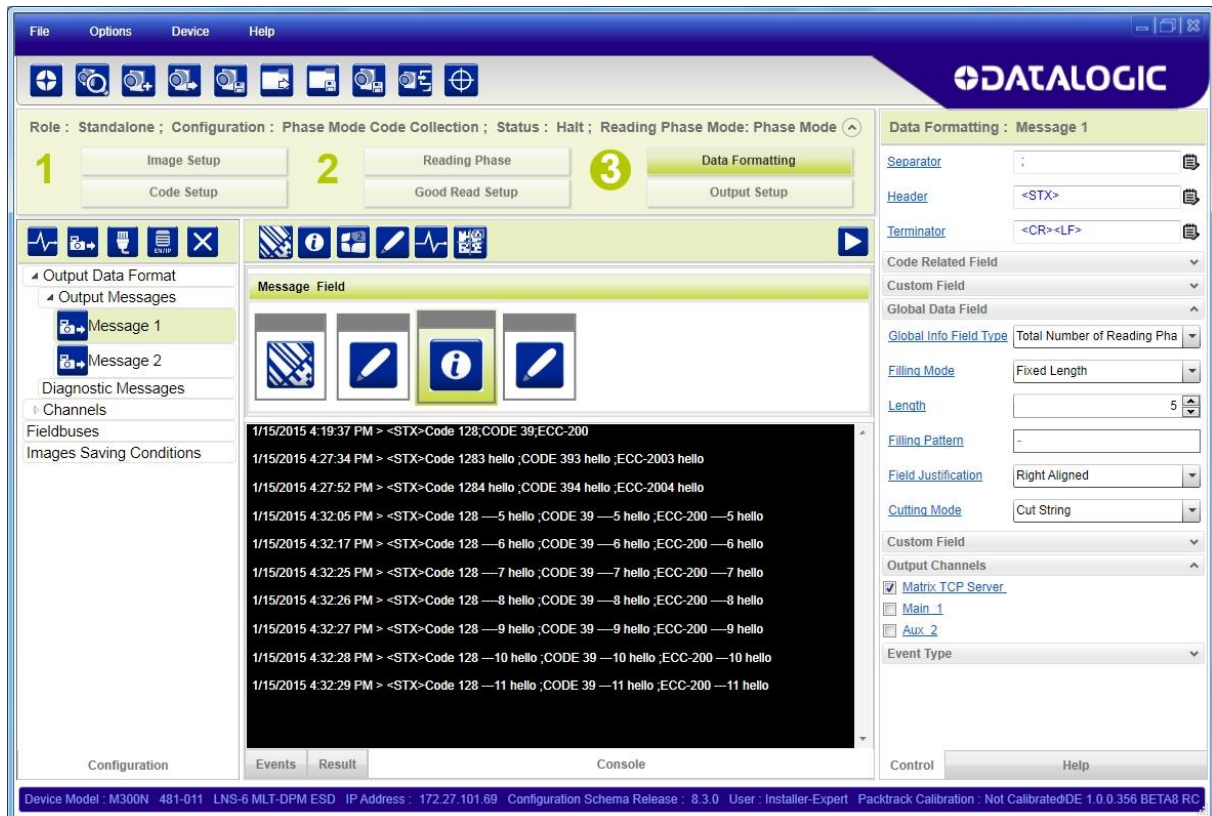
### 6.3 FIELD SEPARATOR

When Operating Mode is set to Code Collection or Code Presentation, the Field Separator character or string is used to separate each formatted code message within the complete output message #n. For example:

**[Header] [formatted Code1] [Field Separator] [formatted Code2] ... [Terminator]**

Each defined message #n can have a different Field Separator.

**Example:**

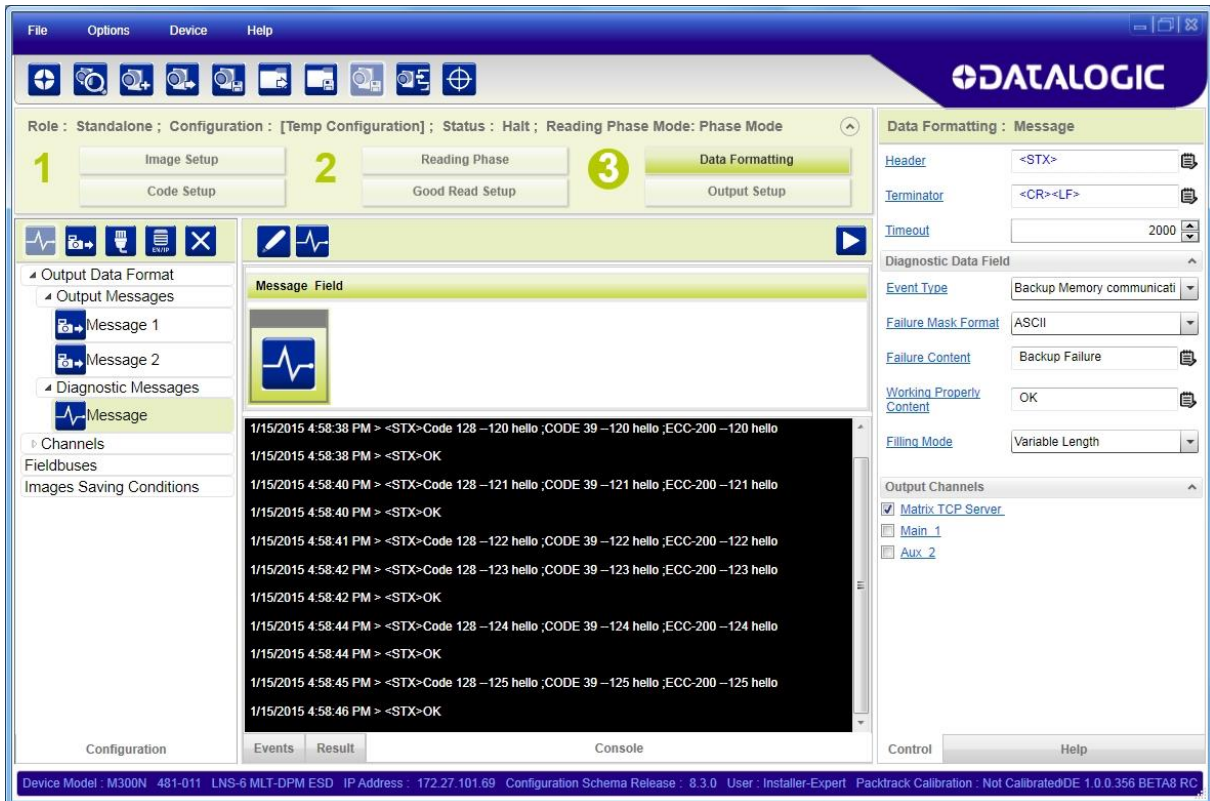




## 6.4 INDEPENDENT DIAGNOSTIC MESSAGES

As a troubleshooting tool or for error monitoring a Diagnostic Message can be sent independently from the code reading message.

For demonstration purposes, the figure below shows the Diagnostic Message for a **Backup Memory Communication Failure** being monitored and sent every 2 seconds on the output independently from the code reading output message.



Typically only the Failure string is defined to avoid unnecessary message traffic.

Only upon failures, the Failure Mask sends a fixed 32-character mask. Each character represents the Standalone/Master device + 31 Slaves. The ASCII mask sends 0 =OK and 1 = Failure. The Binary mask sends non-printable characters.

The mask is appended to the Failure Content message (if defined).



This monitoring could be sent to another channel so as to not interfere with data communication, for example to another Matrix TCP Server connection, as shown below.

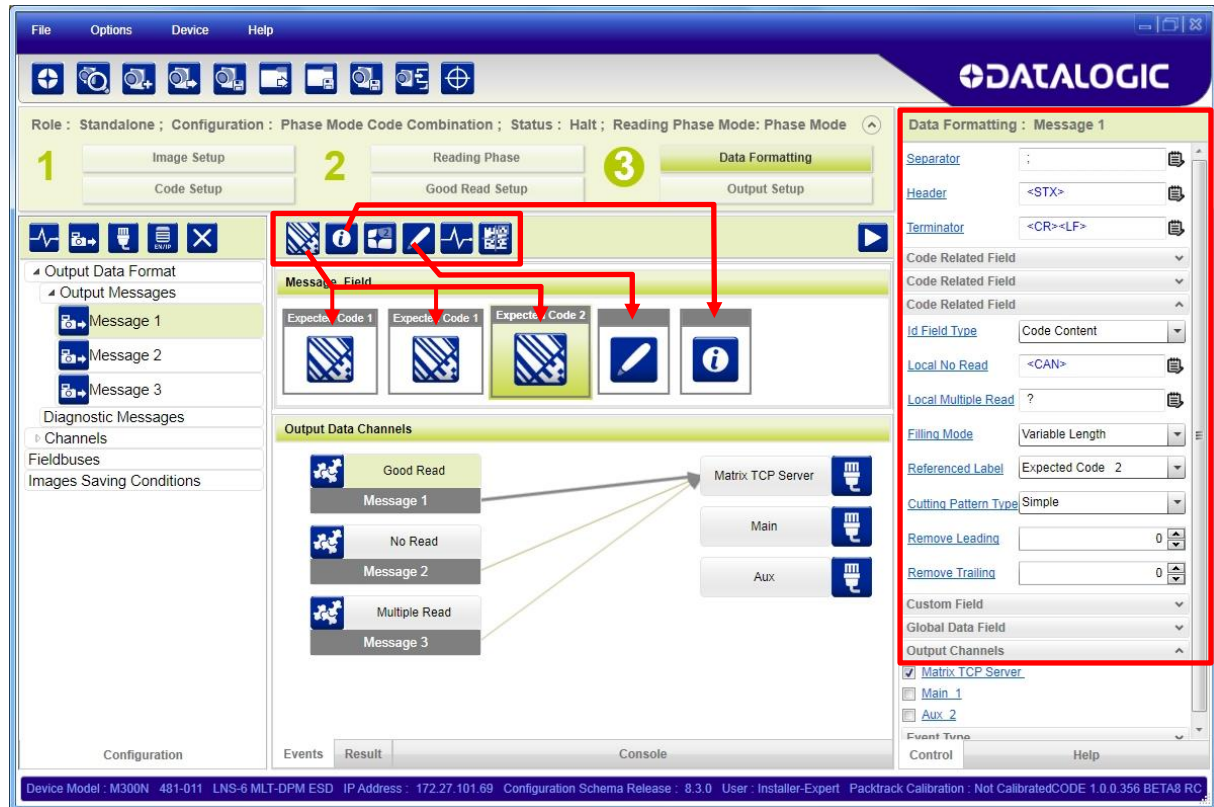


Several Diagnostic fields can be added to the message for complete monitoring.

## 6.5 CODE COMBINATION MESSAGE FORMATTING EXAMPLE

In Code Combination the expected result is always known in terms of code reading. To simplify these examples we will not consider Code Cutting or Justification, all fields are considered with the default value as Variable Length fields.

Recalling the example in par. 5.2:



The DMECC200, QR Code and Code128 types are enabled and present in the Code Combination with the following logical combination:

DMECC200 **OR** QRCode **AND** Code128.

No Read is Enabled; Multiple Read is Enabled; Partial Read is treated as No Read

1. Click on the various field icons to add them to the Message Field Area to compose the message.

You can drag them into different positions to change the ordering of the message fields.

You can also delete them by selecting the field with the mouse (highlighted in green), and then delete it using your keyboard.

Then modify the Data Formatting parameters of each field in the parameters panel.

The Data Formatting Parameters are:

**Message 1 = Good Read**

Header String = <STX>

Terminator String = <CR><LF>

Referenced Label = Expected Code 1

**Code Related Field = Code Symbology**

**Code Related Field = Code Content**

Referenced Label = Expected Code 2

**Code Related Field = Code Content**

**Custom Field**

Custom String = <Space>->Space>

**Global Data Field Field**

Global Info Field Type = Total Number of No Reads

**Message 2 = No Read**

**Custom Field**

Custom String = <CAN>

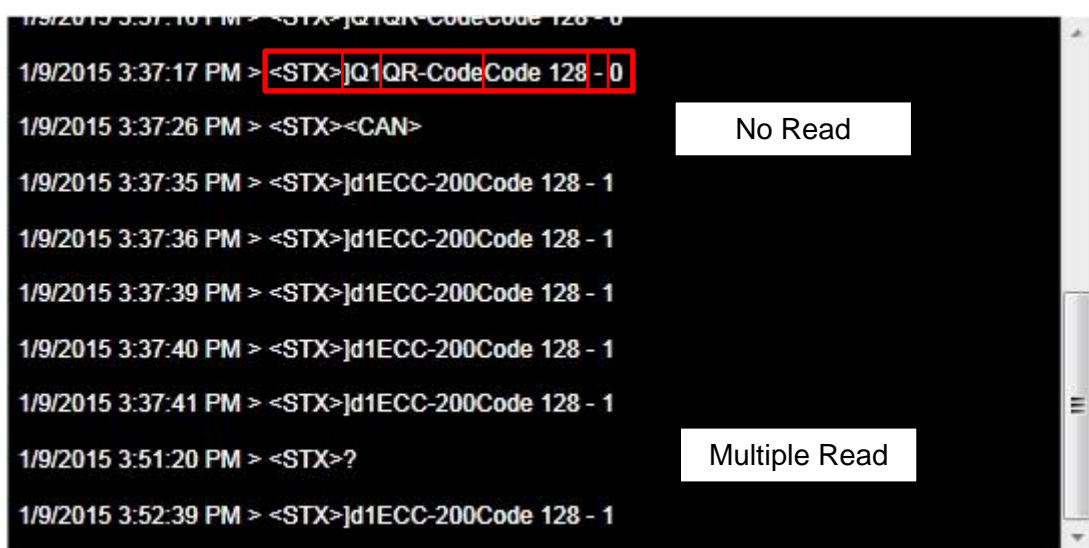
**Message 3 = Multiple Read**

**Custom Field**

Custom String = <?>

The Output Messages are:

Case 1: codes (DMECC200 **AND** Code128) or (QR Code **AND** Code128) are read  
Output: the content of **Message 1 Good Read** is sent to the Host.



## 7 MONITOR

The Monitor feature is designed to check device operation from a remote PC even simultaneously with other monitoring PCs.

It can be used during installation or troubleshooting to check the device operation. The device operates with a minimum of DL.CODE overhead and therefore reading results are much closer to real-time performance.

Monitor also provides diagnostic alarm feedback.

### 7.1 ACCESSING THE MONITOR

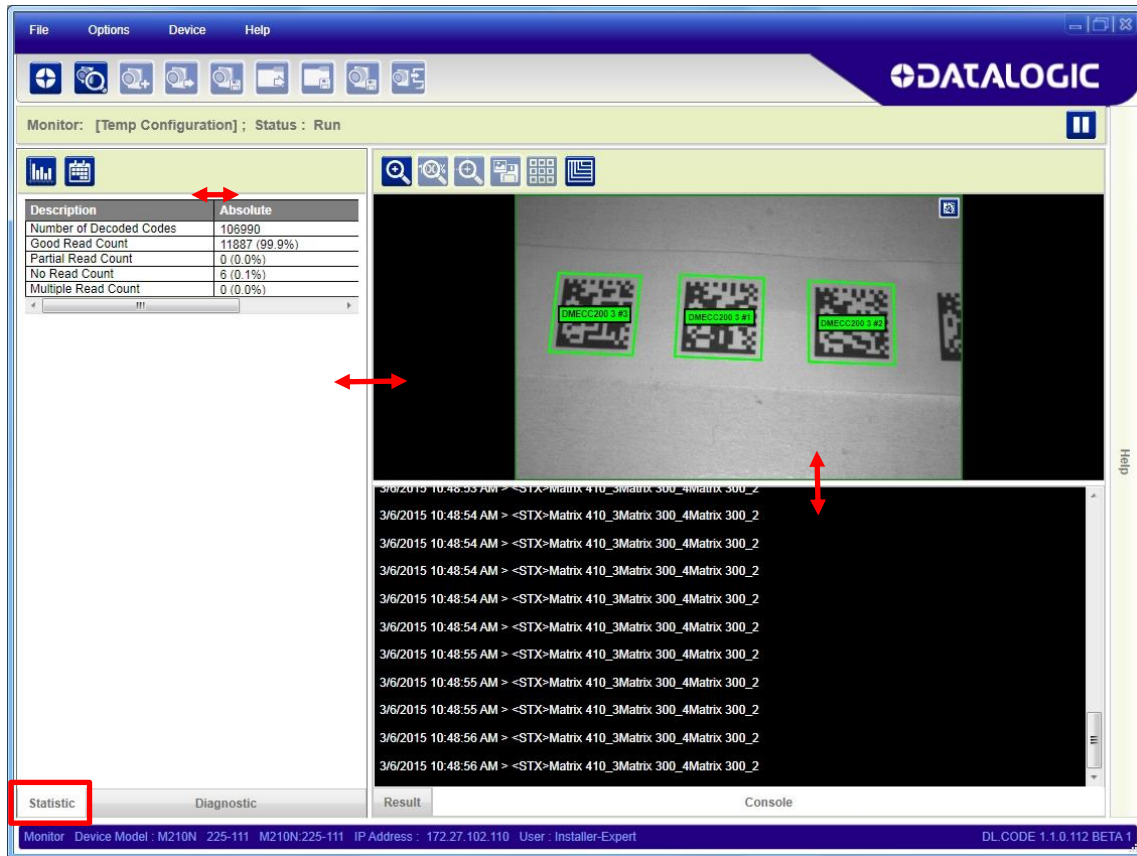
You can access the Monitor page through the File menu or the Monitor icon.



## 7.2 MONITORING STATISTICS

The Monitor loads with the reader in run mode and the Statistics page open. If the device is reading (in Continuous operating mode or One Shot/Phase Mode with trigger active), the reader will show image acquisition.

You can resize the various windows by dragging the edges with the mouse.

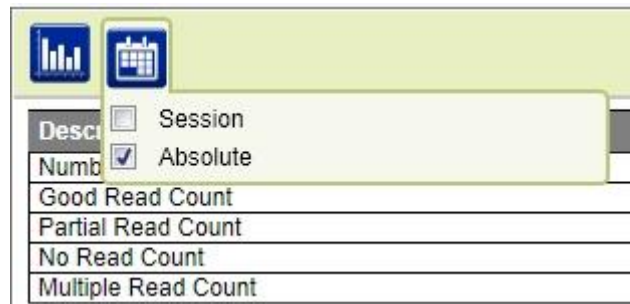


You can toggle between table view and chart view statistics by clicking on the icon.





You can also switch between Session and Absolute statistics.

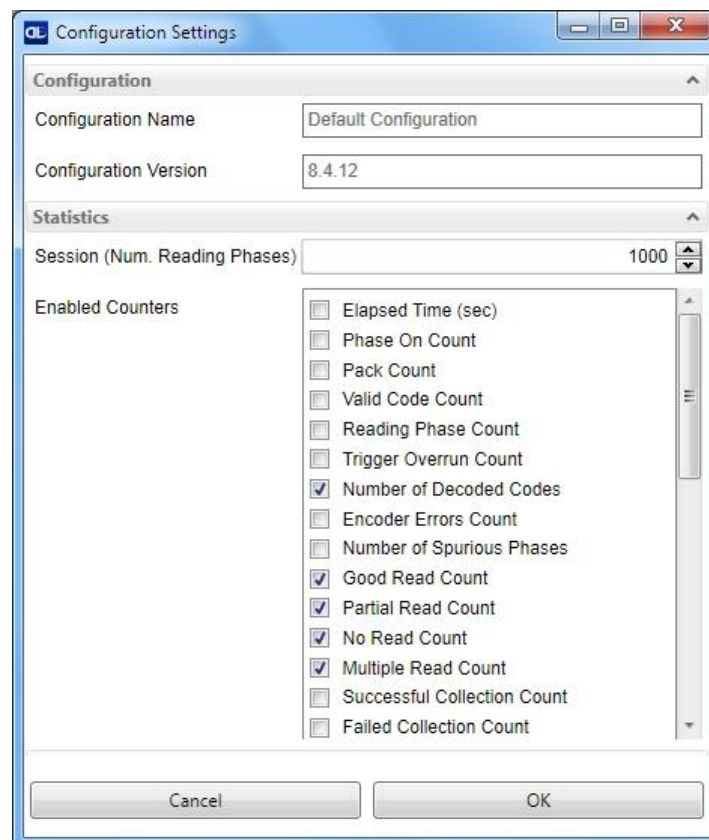


- **Session Statistics:** keep track of the various reporting fields from the last session or the last time the Statistics were reset up to the maximum Session number of reading phases. See below. A session ends if the device is connected to the DL.CODE configuration environment.
- **Absolute Statistics:** keep track of the various reporting fields from the last device power on or the last time the Statistics were reset.

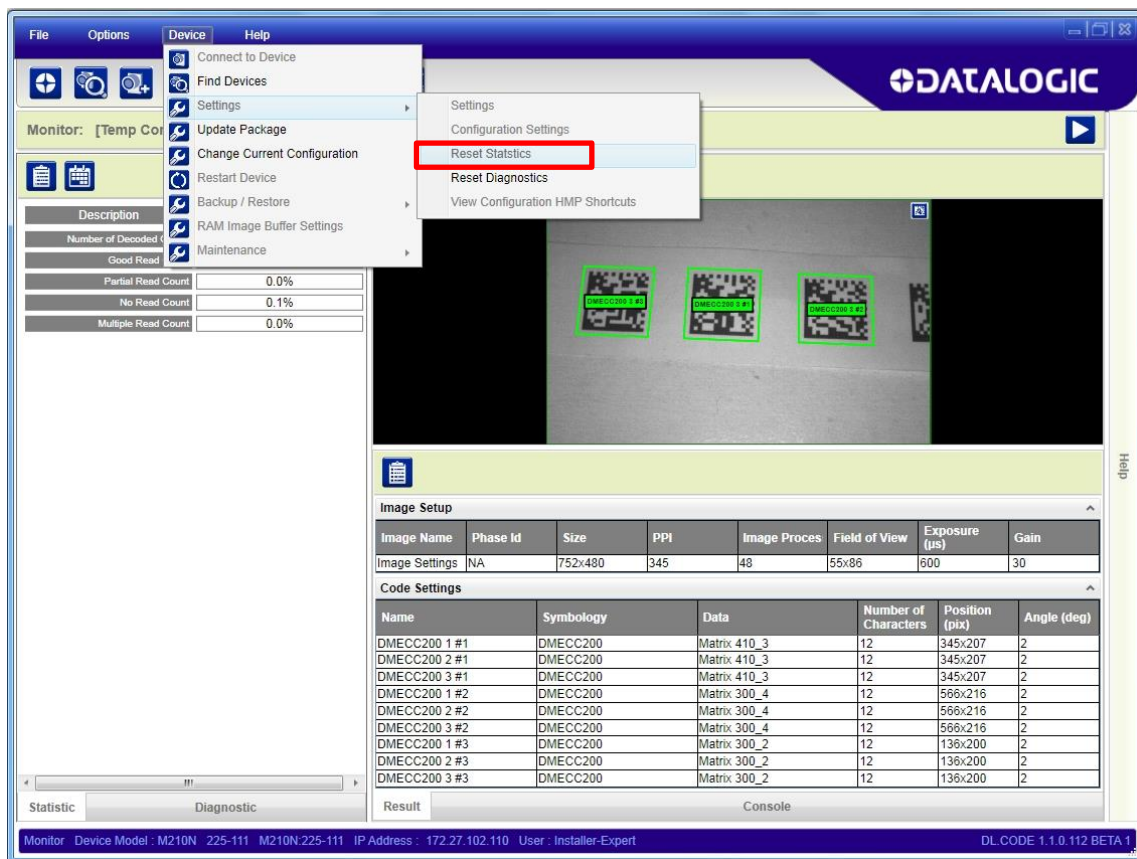
### 7.2.1 Statistics Settings

From the Device menu > Settings > Configuration Settings you can set the number of reading phases to monitor for a Session (from 10 to 1000).

You can also choose which fields to visualize in the Monitor Statistics page.



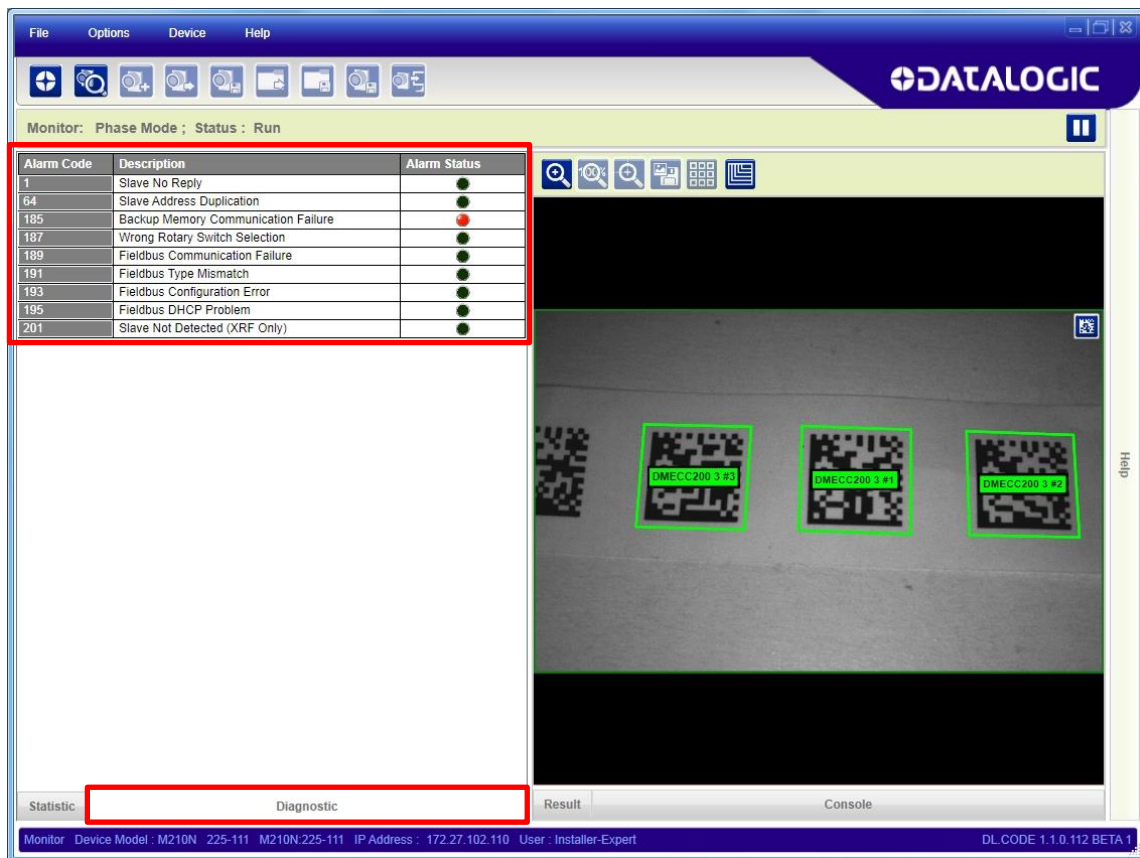
You can reset all the statistics (both Session and Absolute) by selecting the Reset Statistics command from the Device menu > Settings.





## 7.3 MONITORING DIAGNOSTIC ALARMS

Any Diagnostic Alarms will show up as a warning light on the alarm panel.



## 7.4 MONITOR SETTINGS

### 7.4.1 Monitor Images Options

Several options can be set for the Monitor window. They are set in the Options>UI Settings menu on the Monitor tab.

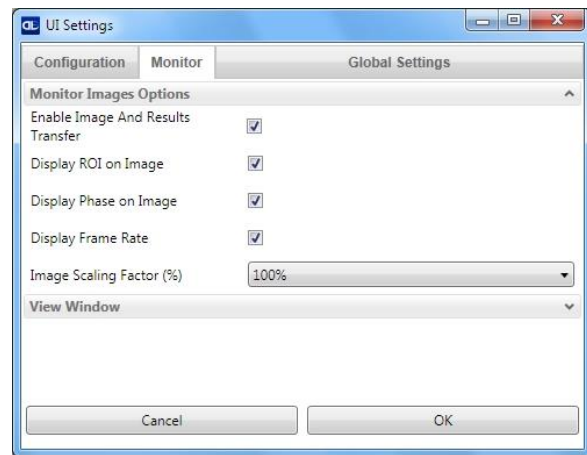
**Enable Image and Results Transfer:** enables the image feedback in the Monitor window.

**Display ROI on Image:** shows the bounding box around each code on the image.

**Display Phase on Image:** shows the Phase identification number in white letters in the upper left-hand side of the image.

**Display Frame Rate on Image:** shows the **frame rate of the image visualization** on the UI in white letters in the upper left-hand side of the image. **This is not the Frame Rate of the device image acquisition!**

**Image Scaling Factor:** allows downsizing the image subsampling to increase the visualization performance.



### 7.4.2 View Window

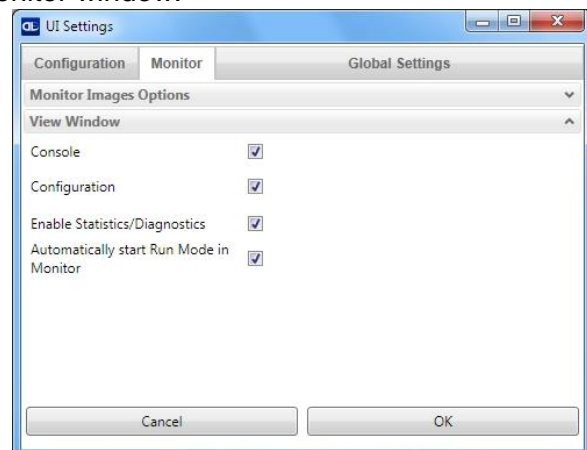
You can select several options to view in the Monitor window.

**Console:** shows the Console panel to view output messages.

**Configuration:** shows the Configuration panel to allow viewing the configuration parameters (read-only). **Configuration cannot be performed from the Monitor window.**

**Statistics/Diagnostics:** shows the Statistics and Diagnostic Alarms panels.

**Automatically start Run Mode in Monitor:** when launching Monitor the window opens with the device in Run Mode. This is the default setting.



## 8 IMAGE SAVING

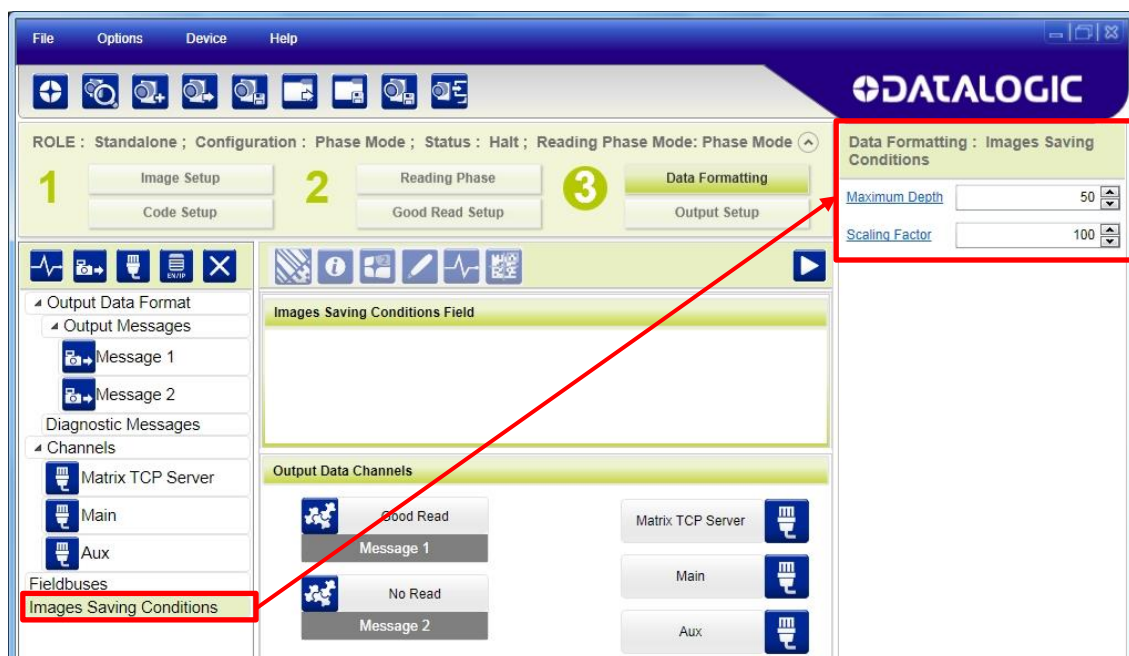
### 8.1 DEVICE IMAGE BUFFER

The Device Image Buffer allows saving captured images to the internal device memory (RAM) for data collection analysis. These images can either be sent to a remote or local PC or an FTP server at run time; or they can be downloaded from the buffer when the device is offline (not in run mode).



**CAUTION:** The internal device memory has a circular buffer to avoid overrunning the available memory. To save images correctly to the internal buffer, you need to calculate the number of images the buffer can hold based on the image resolution for your device model.

More images can be stored in memory by scaling down the image size.



**NOTE:** Transferring images remotely may slightly reduce the decoding rate. It is recommended to use this feature only when enough time is available to guarantee the decoding of all images.

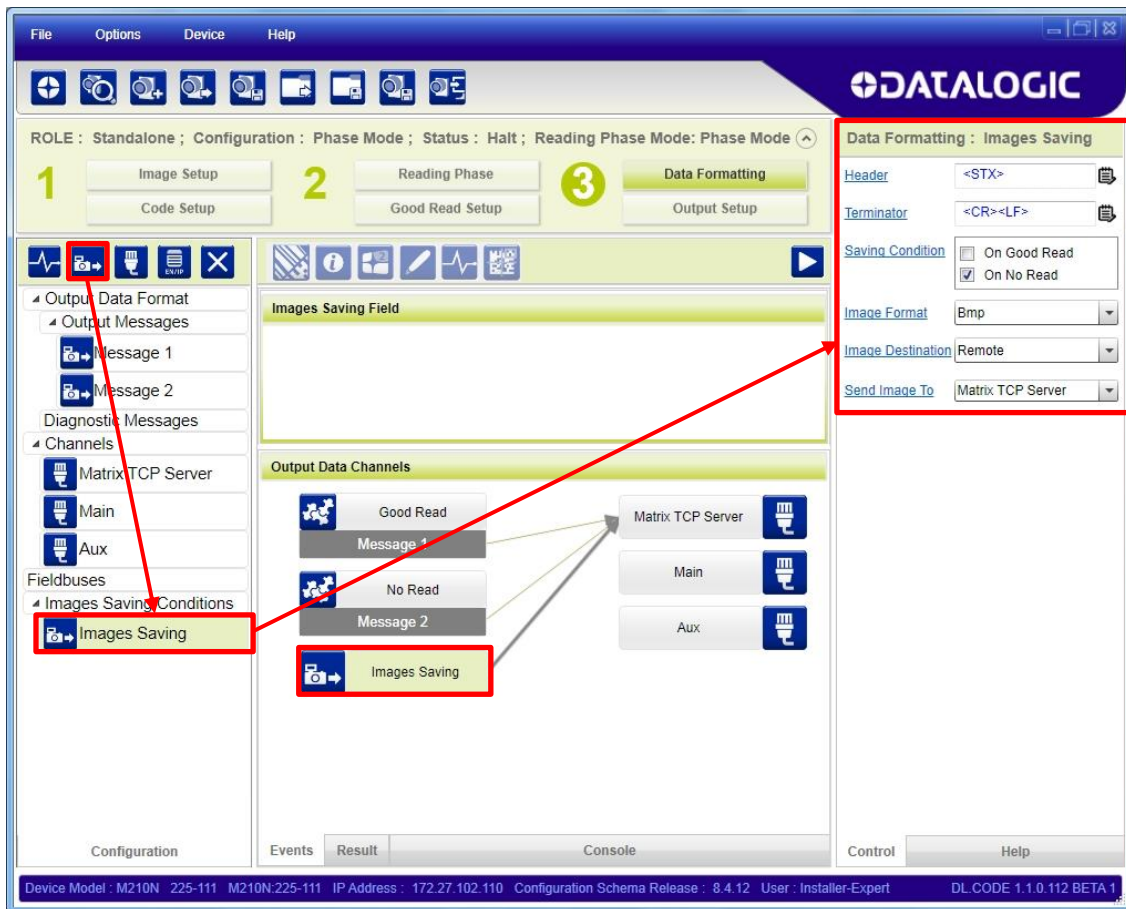
### Image Saving Conditions

**Maximum Depth** sets the total number of images that can be sent from or saved to the Device Image Buffer. Set this figure to a practical value taking into consideration the above mentioned CAUTION.

**Scaling Factor** allows reducing the size of images to be saved so that a greater number of images can be saved in the Device Image Buffer.

### 8.1.1 Image Saving Using Matrix TCP Server/Client

To add an image saving condition to the configuration, click on the Add Image Saving Condition icon.



By default the Image Saving destination is set to Remote output over the Matrix TCP Server (on-board Ethernet) channel. If desired a dedicated channel can be added for image transfer.

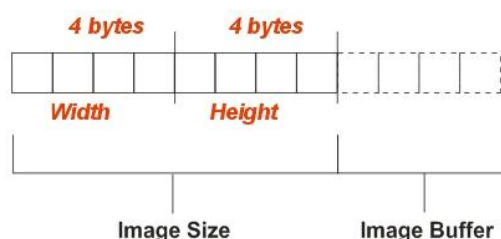
According to the selected **Saving Condition** parameter, after data collection analysis, images can be sent at run time directly from the Device Image Buffer to a remote or local PC.

The Image Saving format is:

[Header] [Image Buffer] [Terminator]

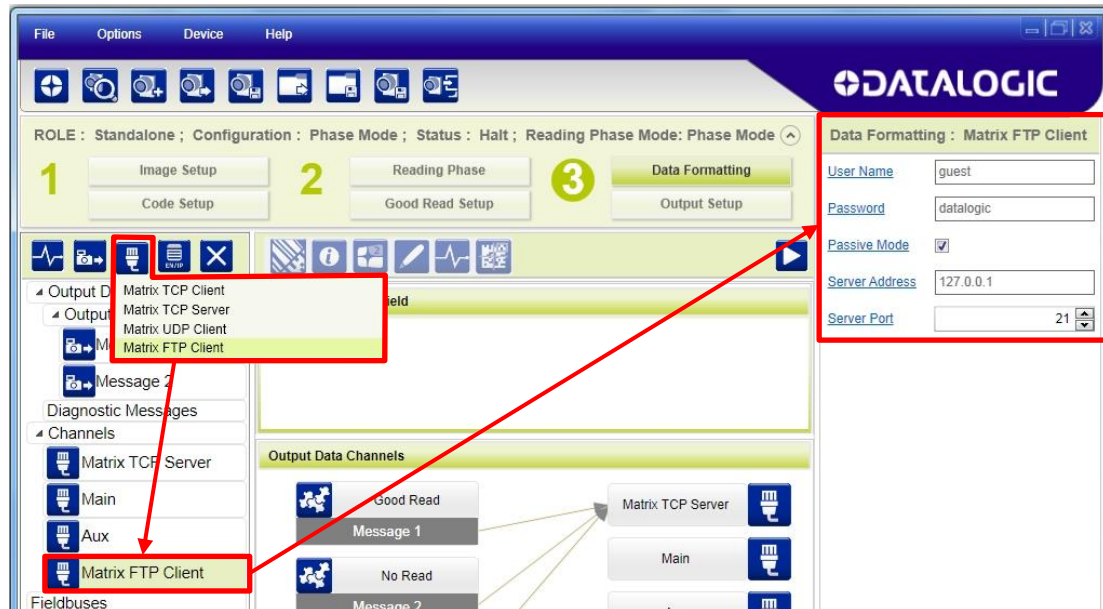
The Image Buffer contains the image data in the selected format (.bmp, .jpg, .png, .tif).

If the RAW data format is selected, the Image Buffer data is preceded by 8 bytes which indicate the image size: the first 4 bytes indicate the image columns (width) while the last 4 bytes indicate the image lines (height) in little-endian ordering.



### 8.1.2 Image Saving Using Matrix FTP Client

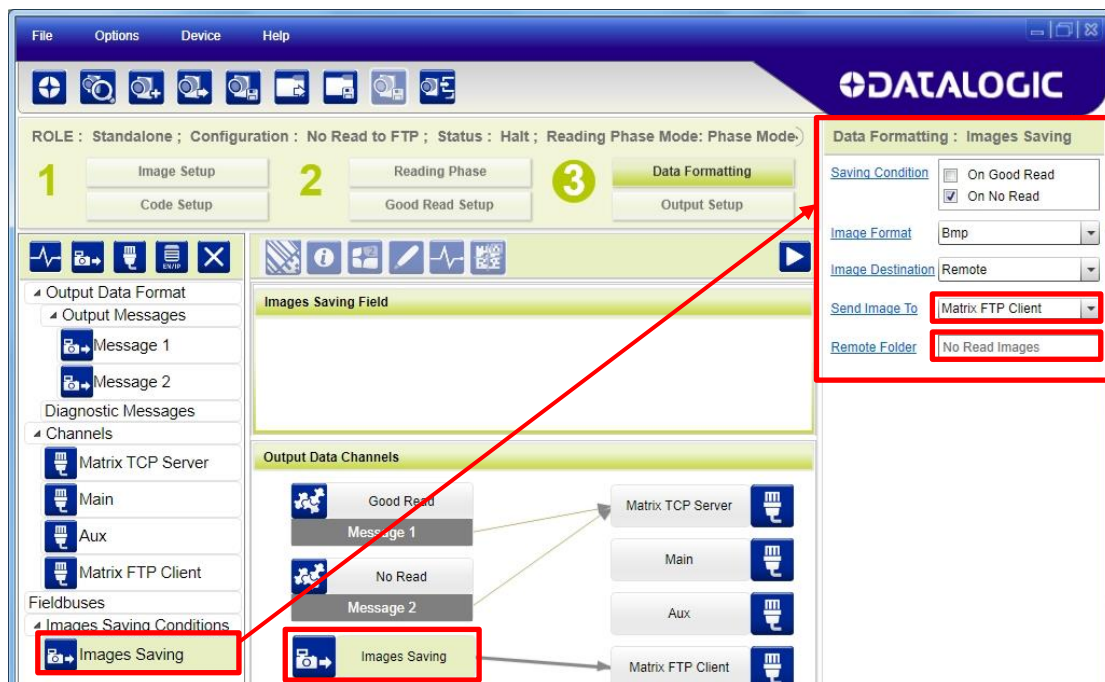
Images can be sent at run time directly from the device image buffer to an FTP Server through a Matrix FTP Client channel. The Matrix FTP Client must be added as a new communication channel since it is disabled by default. Do this by selecting the channel icon.



- The FTP Server Address must match the Server PC.
- The default FTP Username and Password must match the ones set in the Server PC.

Now select Images Saving and set the **Send Image To** parameter to Matrix FTP Client.

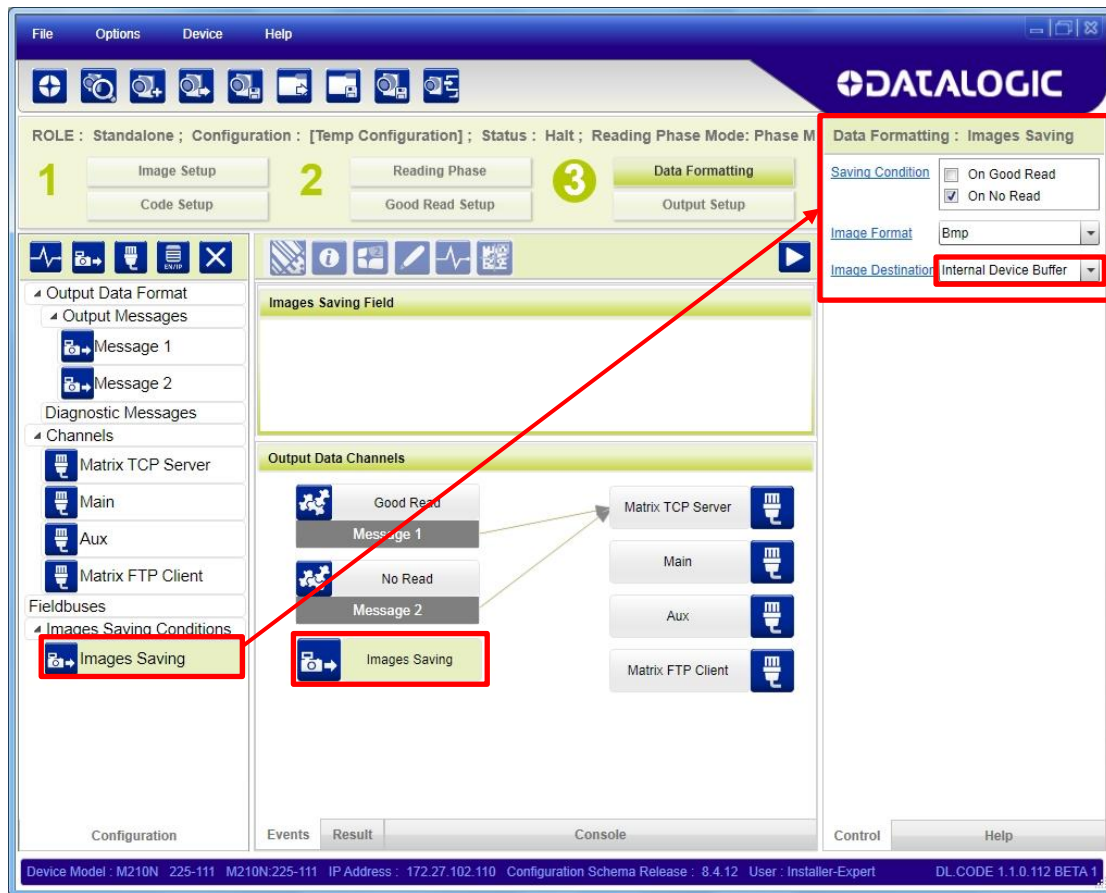
Input the name of the Remote Folder on the FTP Server to which the image files must be saved.





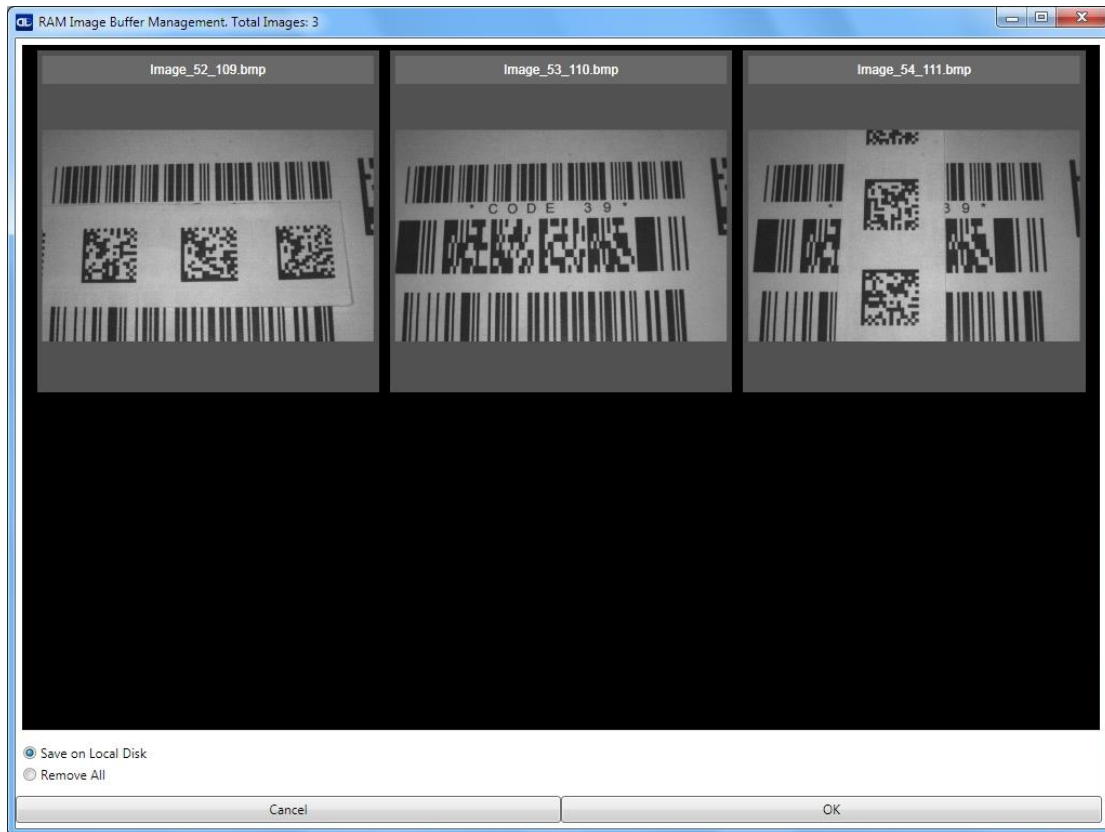
### 8.1.3 Image Saving Using Internal Buffer

Images can be saved to the Device Image Buffer and be downloaded to a PC when the device is offline.



To download the saved images, the device must be in offline mode. Through the Device menu>Device Image Buffer you can access the **Image Buffer Management** window.





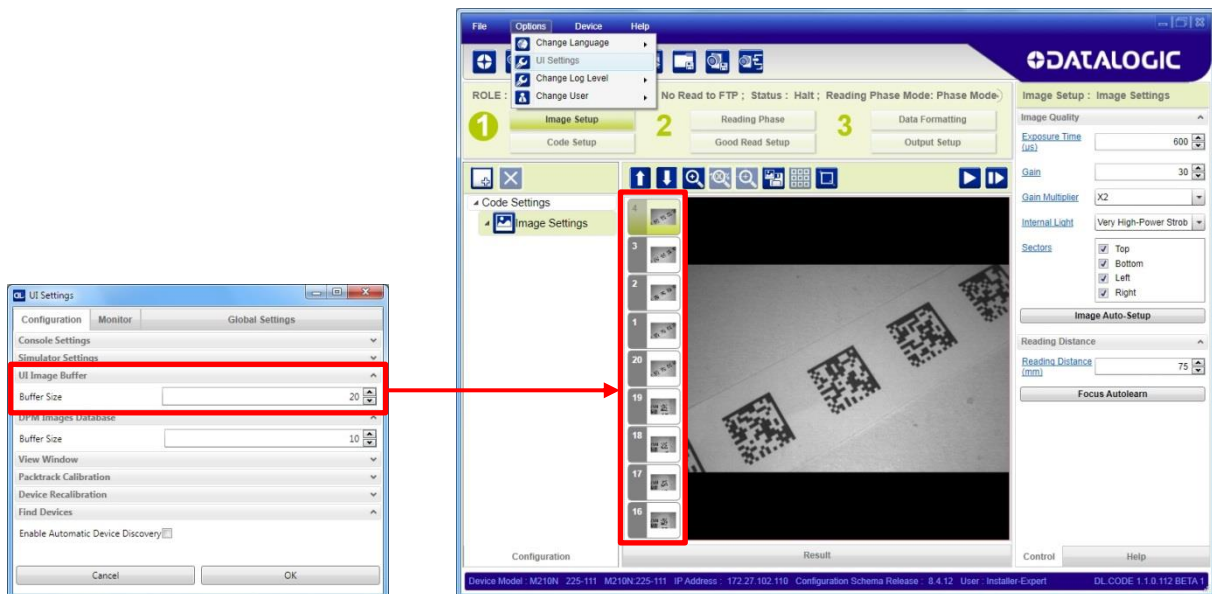
Upon opening this window the images in the Device Image Buffer (RAM) are transferred to the DL.CODE Device Image Buffer Management window and the images are deleted from the device RAM.

You can save all the images in a zip file to the PC or you can delete the images from the DL.CODE Image Buffer Management memory.



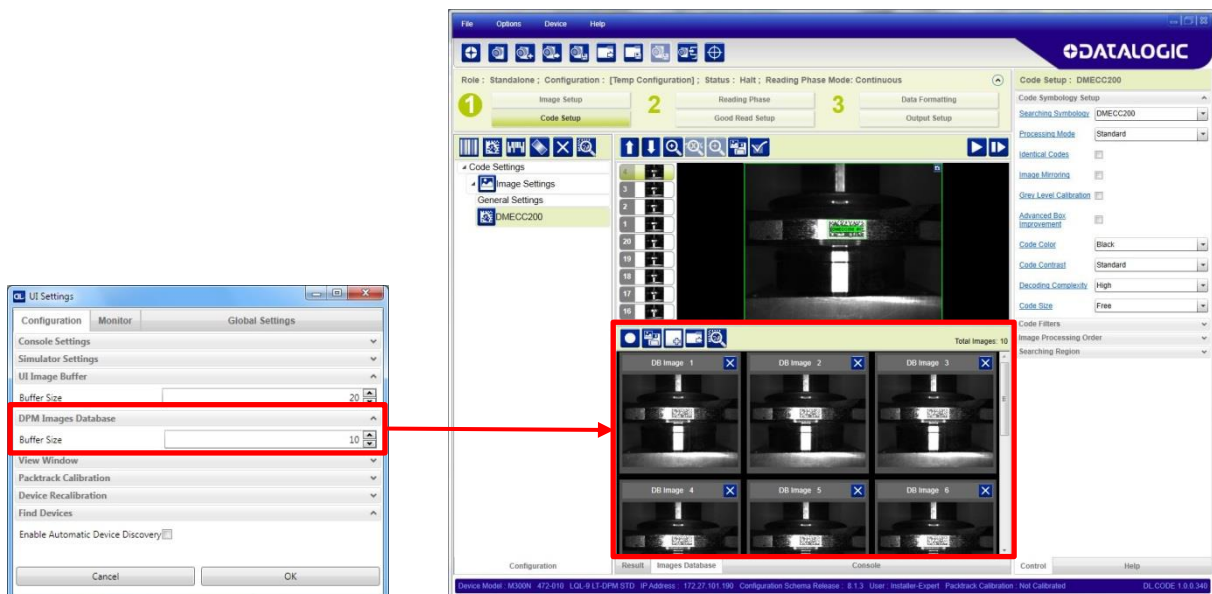
## 8.2 UI IMAGE BUFFER

The UI Image Buffer manages the images captured through the DL.CODE Play and Capture features.



## 8.3 DPM AUTOLEARN IMAGES DATABASE

The DPM Image Database allows saving images to be used by the DPM Autolearn Calibration tool to help find the best combination of parameters for DPM applications.



For more details see chapter 11.

## 9 MULTI DEVICE CONFIGURATION OPTIONS

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Multi Device configurations (also called Master/Slave configurations), are designed to collect data from several devices connected together in an ID-NET™ network and send data output to the Host system.



**NOTE:** DL.CODE only supports Master/Slave SYNCHRONIZED ID-NET network configurations.

The general procedure is to:

1. Mount all the readers (mechanical and electrical installation) with factory default settings (Standalone).
2. Connect to the designated Master device in DL.CODE and open New Configuration - Multi Device. You will be prompted to change the device to Master. Click Yes. The device will be reset.
3. The Slave units will automatically be recognized. Then **Apply** the changes.
4. Select Phase Mode or PackTrack Configuration and complete the configuration of all the application parameters (including Image Setup) and save them to the Master with the option to **Clone Master configuration on Slaves**.
5. Connect to each Slave reader via Ethernet and set the photometric parameters (**Image Setup**) of each Slave device and save them.

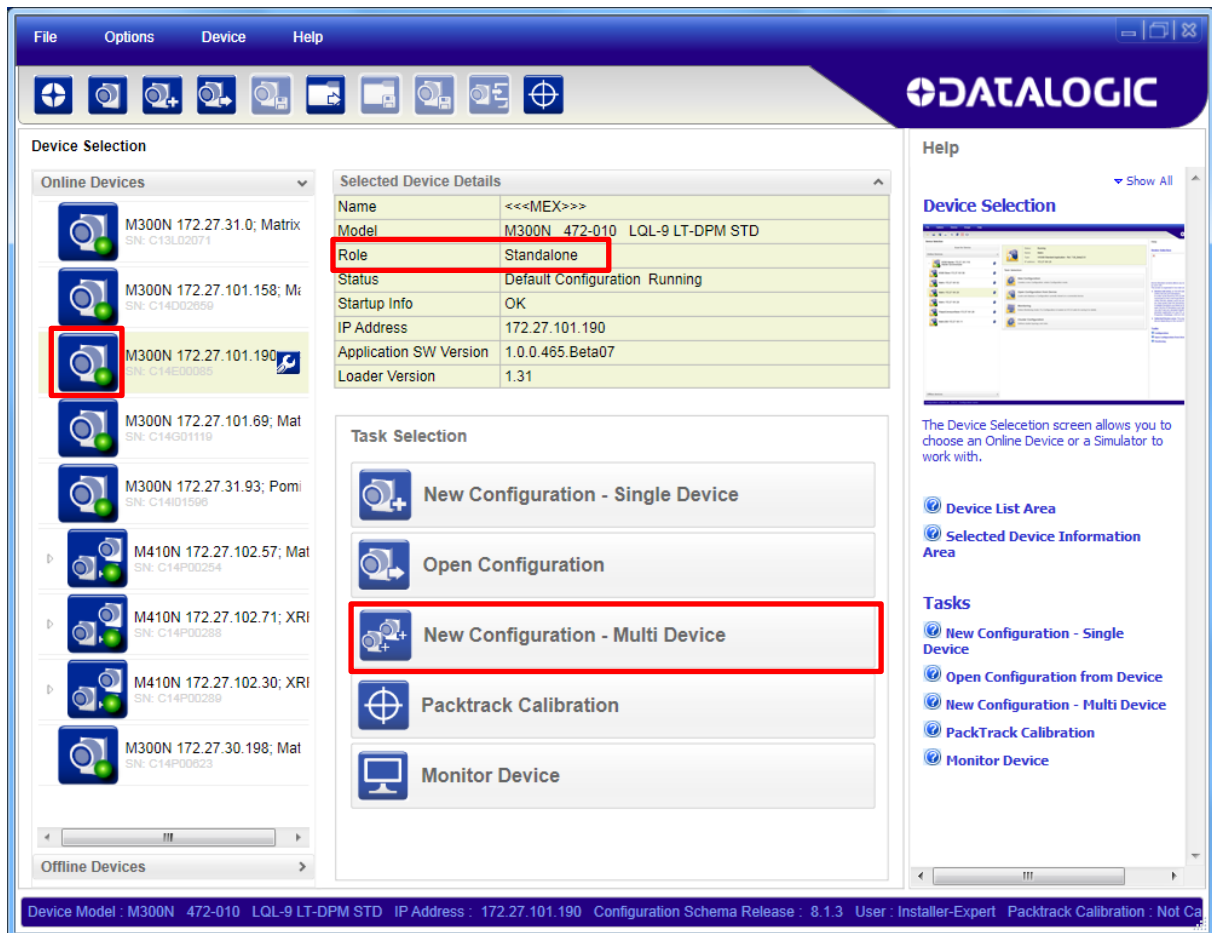
In order to automatically recognize the ID-NET Slaves, all devices must be physically installed and electrically connected (including ID-NET network wiring). Run DL.CODE and verify that all the devices are discovered and shown in the device list area.



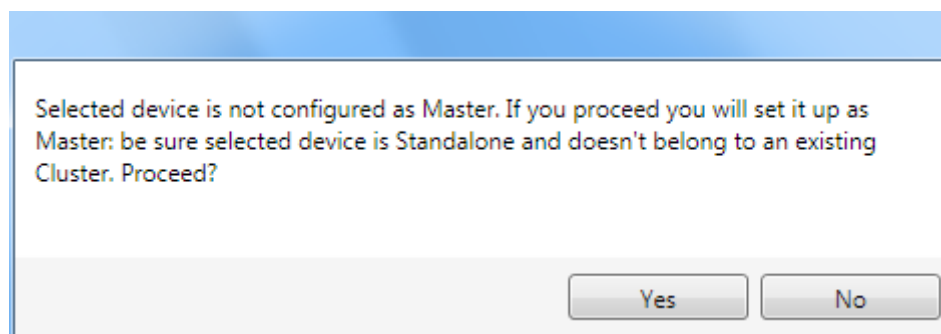
**NOTE:** If necessary, Slave device photometric (Image Setup) parameters must be configured separately through DL.CODE. This is preferably done through each device's Ethernet TCP/IP channel. If Slave devices are not connected to Ethernet you must temporarily (manually) connect them one by one to perform Image Setup.

## 9.1 MASTER CONFIGURATION

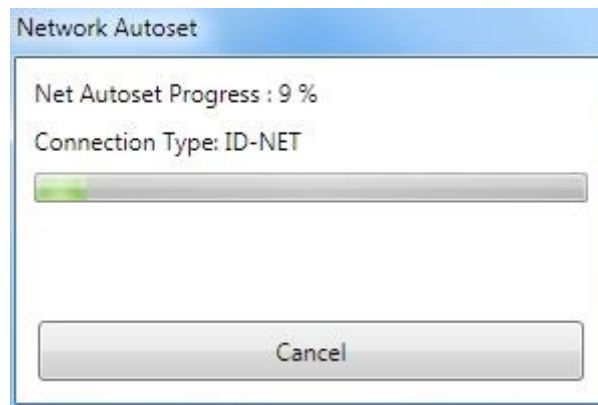
First start with the desired device to assign as ID-NET Master (current default setting is Standalone).



Select New Configuration – Multi Device from the Task area.

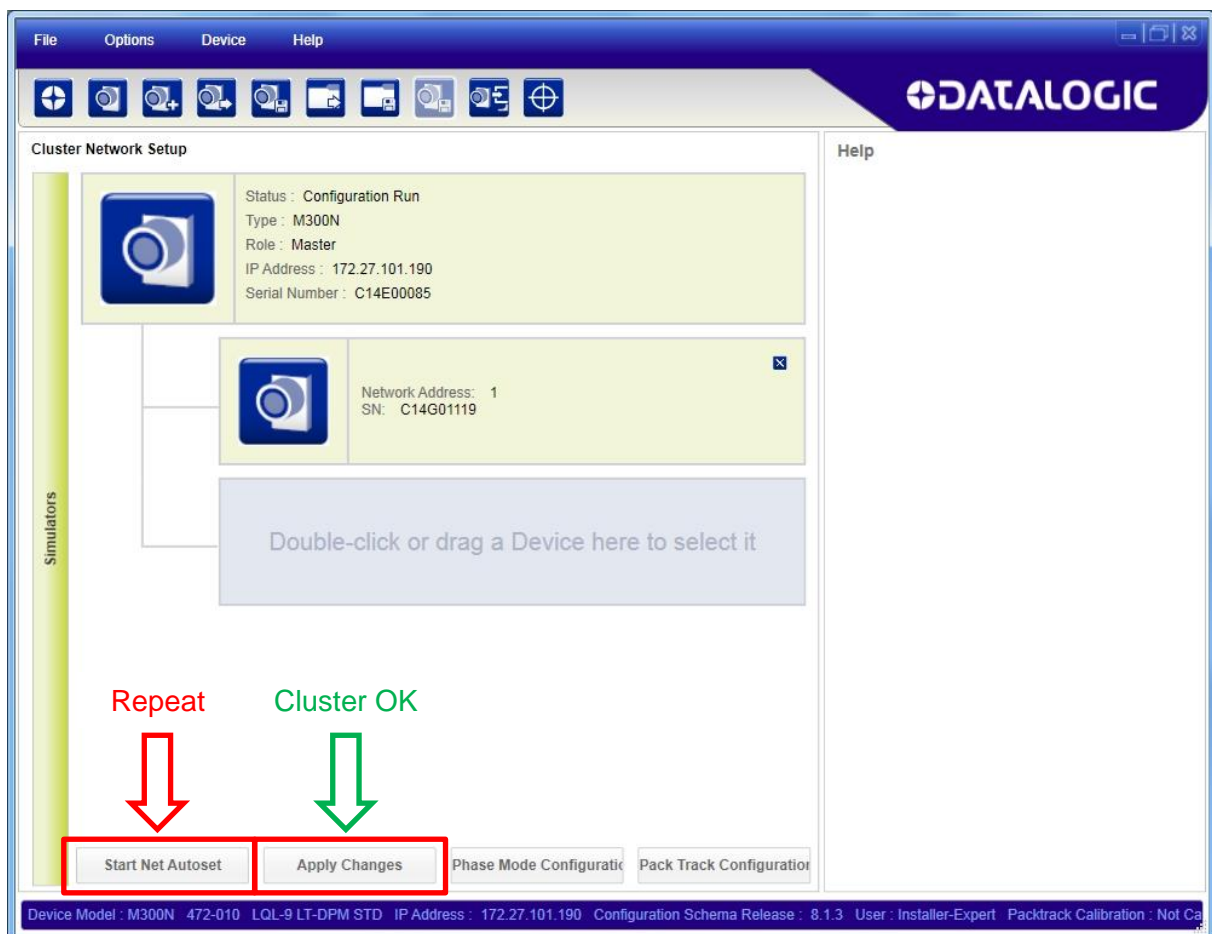


The Net Autoset feature automatically starts to find Slave devices connected to the ID-NET network of the Master.



When finished, if all the Slaves have been correctly recognized click on the **Apply Changes** button.

If not, verify all device connections and power, then repeat the operation by clicking on the Start Net Autoset button.

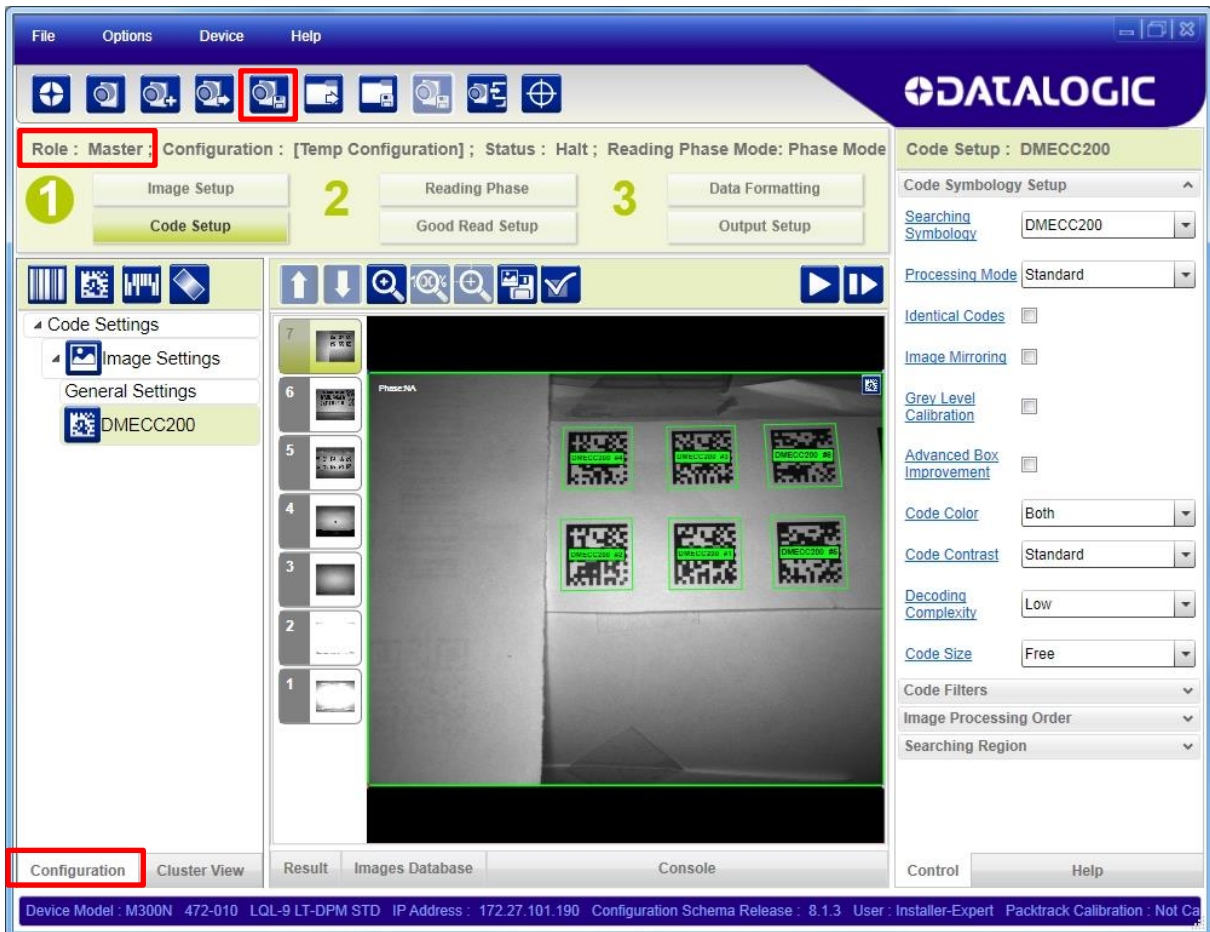




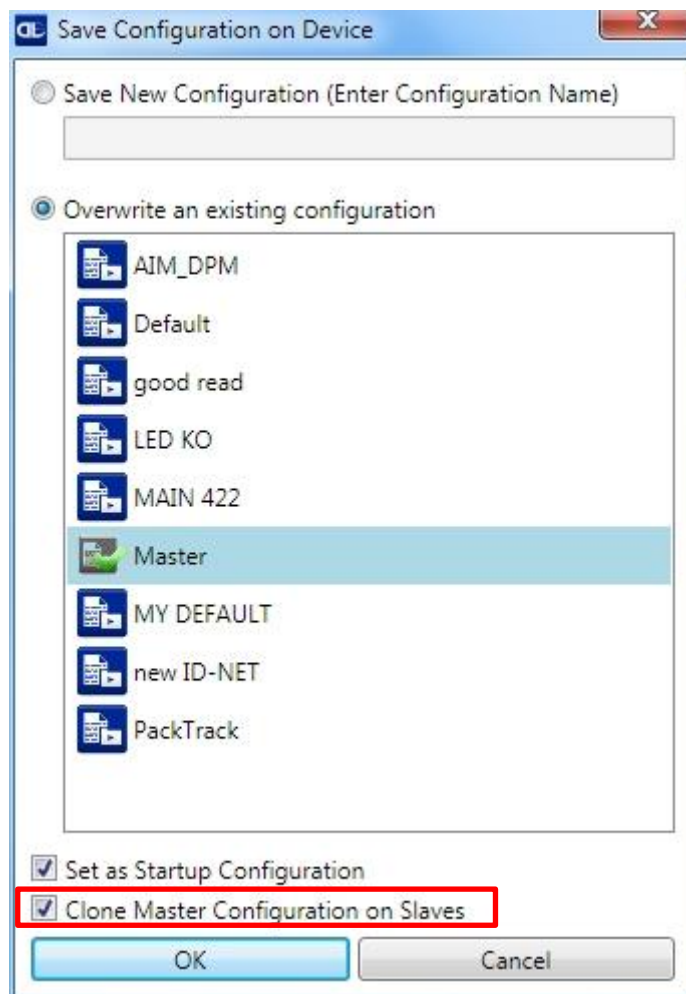
Click Yes to store the Slave table on the Master.

Depending on the application type, click on either the **Phase Mode Configuration** or the **PackTrack Configuration** button to start the configuration. This will perform a pre-configuration of the operating mode.

You can now complete the configuration of the Master including all the application specific parameters.



Now save to a configuration on the Device (i.e. Master) making sure to check the **Clone Master Configuration on Slaves**.

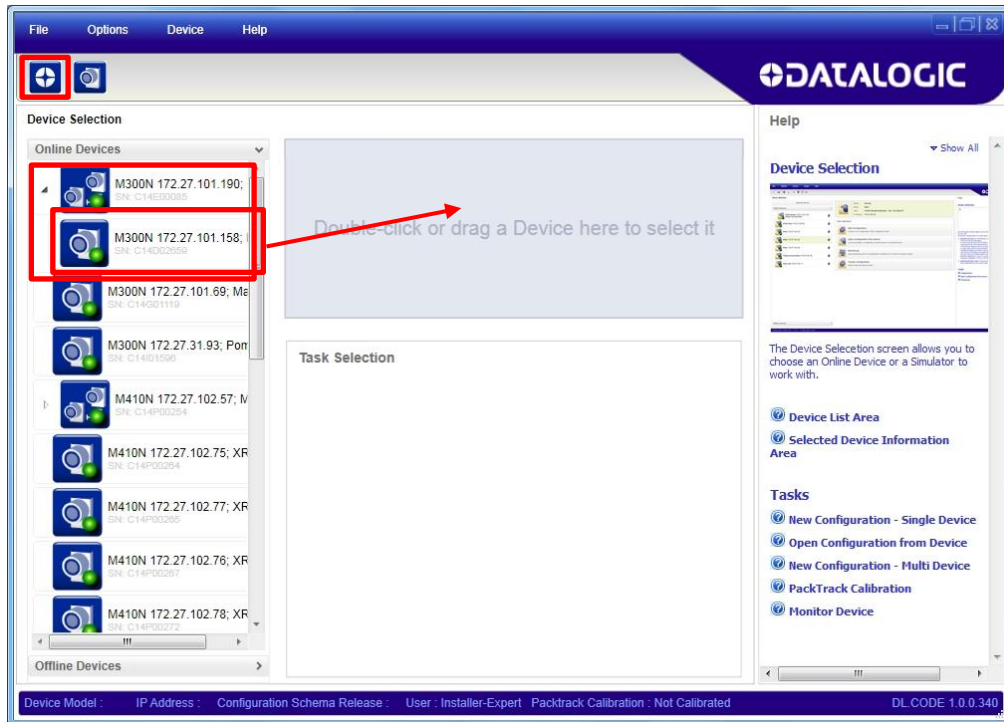




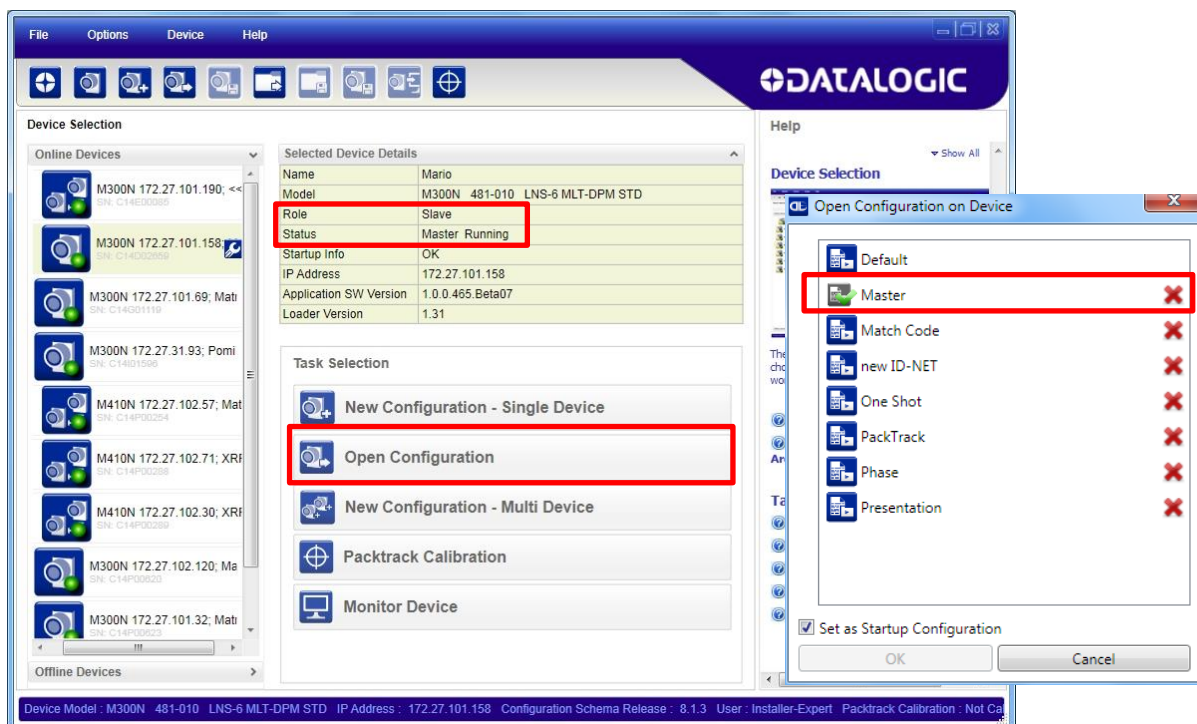
## 9.2 SLAVE CONFIGURATION

Now that the ID-NET network is configured, only the Slave photometric (Image Setup) parameters need to be set.


To do this, click on the Getting started icon and open the Master branch to see the connected Slaves. Each Slave can be connected to through its Ethernet interface.



Open the configuration named "Master" from the Slave reader.

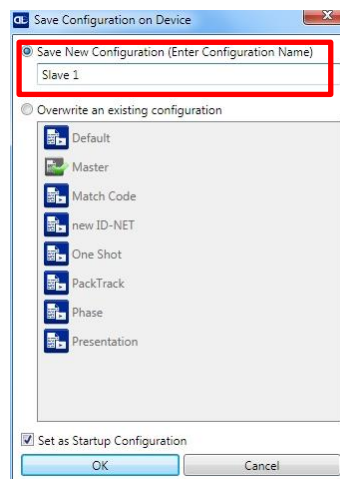




When the configuration opens, pause run mode and execute the Image Auto-Setup feature to adjust the photometry of the Slave reader. Verify the focus and decoding with the capture image  and Code Setup page.



Now save the configuration to the Slave device using a unique name (i.e. Slave 1).

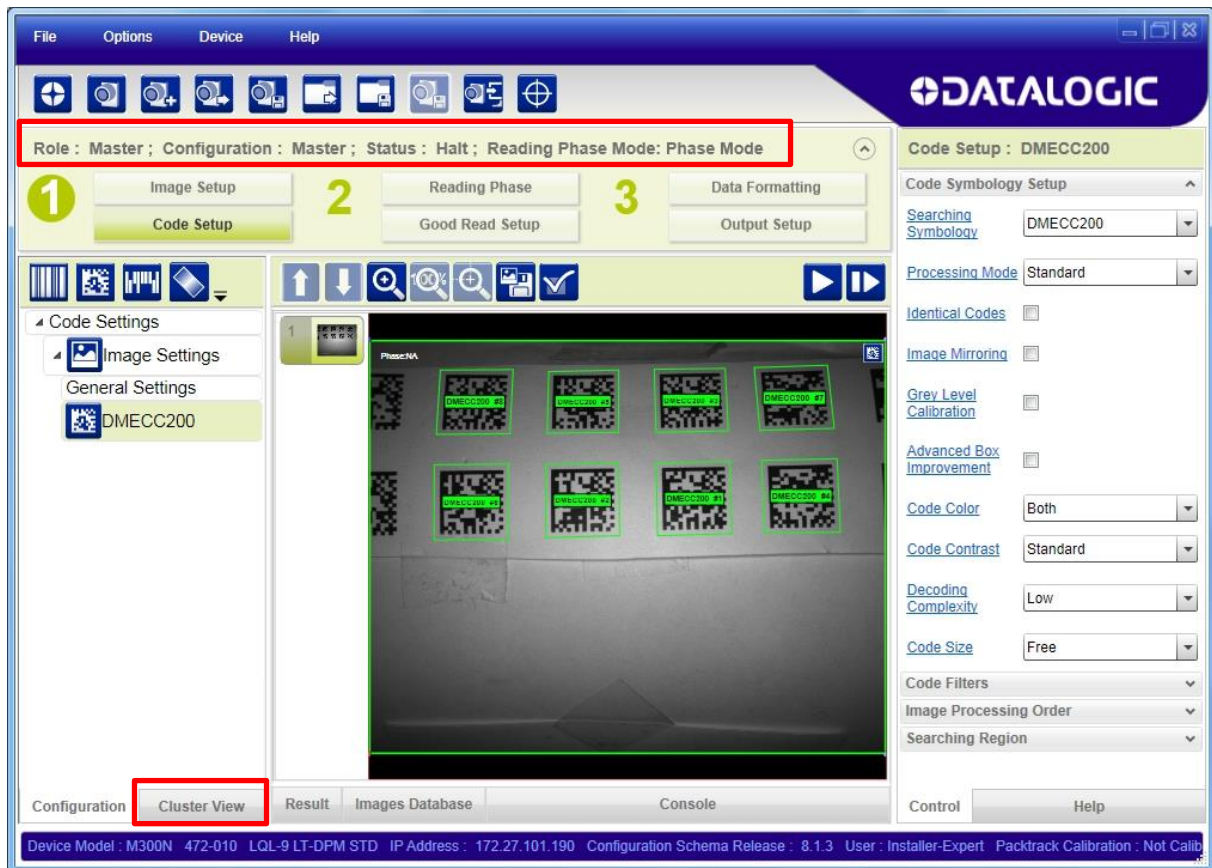


Repeat this procedure for each Slave device until the entire network is configured.

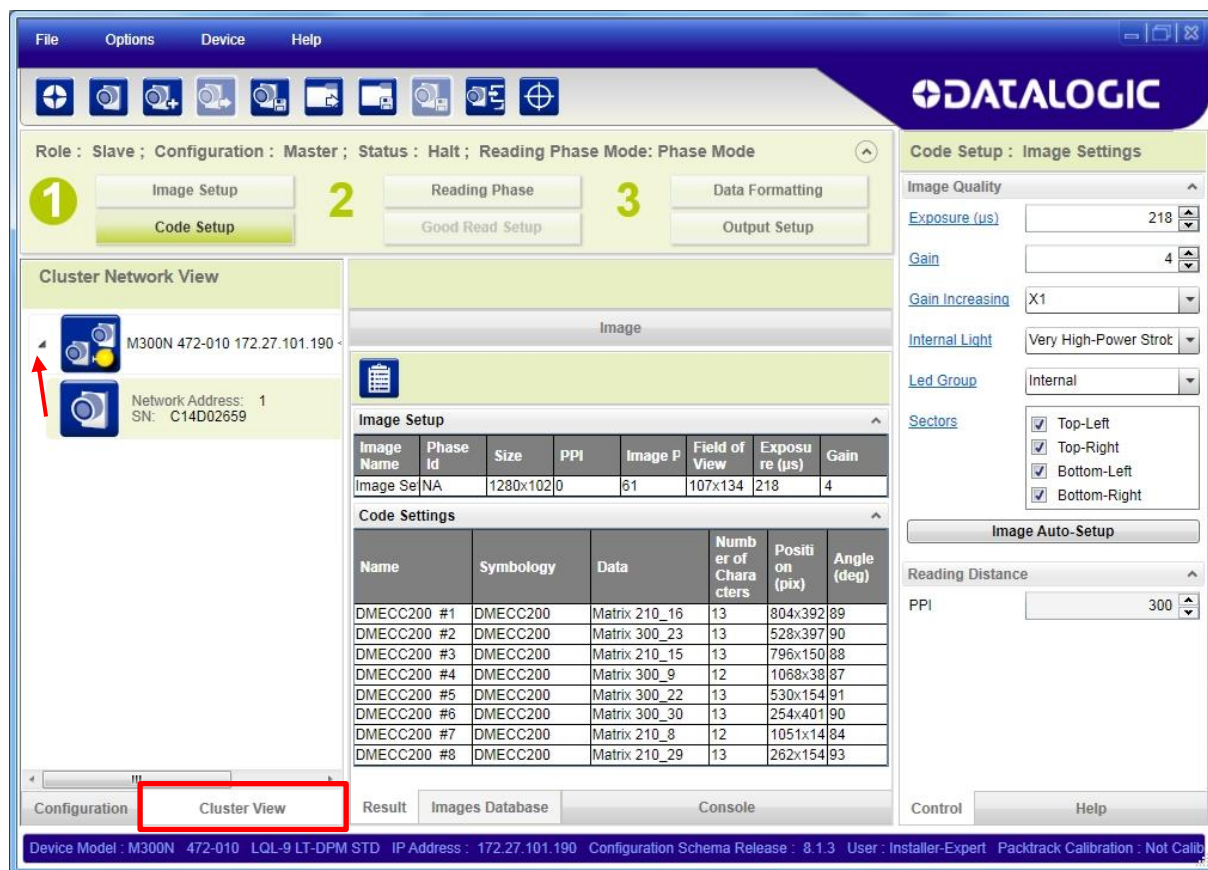
### 9.3 VERIFY MASTER/SLAVE SETUP

Click on the Getting started icon, connect to the Master and open the Master configuration.

When the configuration opens, pause run mode and capture an image. You can verify the parameter settings and that the images are correctly captured with decoded codes.



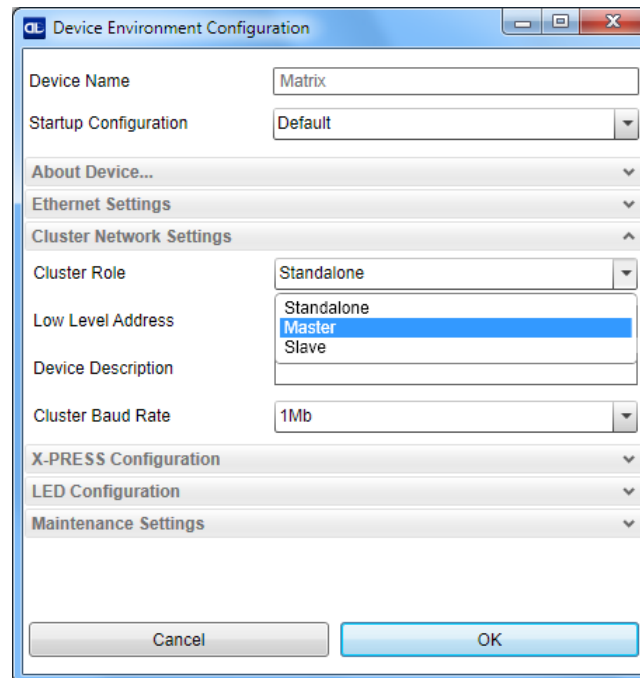
To see the connected Slaves, Click on the Cluster View tab at the bottom of the screen and open the Master branch.



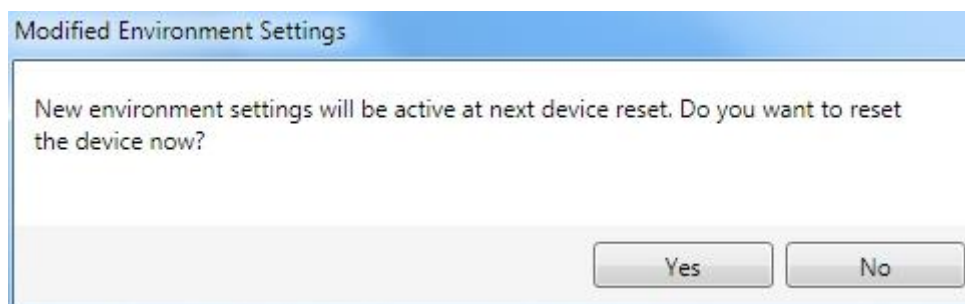
## 9.4 ALTERNATIVE DEVICE ROLE SELECTION

To set up a Master/Slave Cluster Role you can also enter the Device Environment settings from the Device menu>Settings>Environment and open the Cluster Network Settings group.

Change the Cluster Role to Master or Slave accordingly.



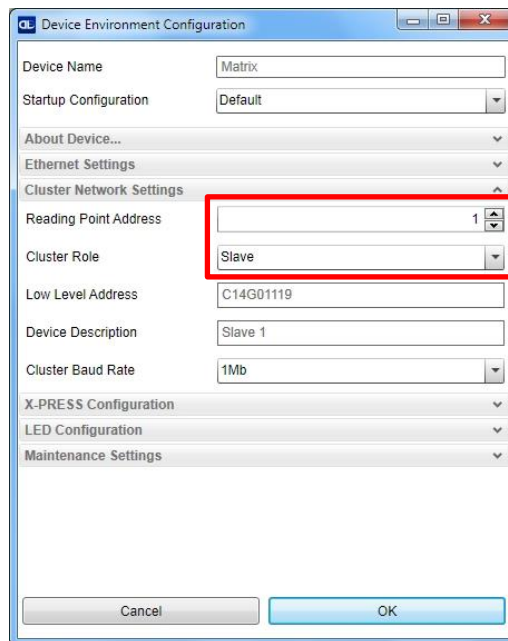
After clicking OK you will be prompted to reset the device to be recognized as Master.



Click Yes and wait for the device to reset. It may be necessary to wait several seconds and then perform a Discovery to refresh the device list area. You should now see the Master device with its relative icon.



Likewise you can set the device **Cluster Role** to Slave and the **Reading Port Address** (ID-NET address) according to the network configuration.



Complete the Slave configuration and save it to the device.

Complete all the ID-NET Slaves in the same way.

The Master must be set to expect the same number of slaves as foreseen by the application. Now by simply making the electrical connections the network will be automatically recognized upon power up.

## 10 PACKTRACK CALIBRATION

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PackTrack Calibration can be performed on all Standalone or Master Matrix N family readers that support this feature.

### 10.1 REQUIREMENTS

The following is a list of required hardware/software that supports PackTrack for Matrix and is necessary for performing the PackTrack Calibration.

- DL.CODE release: 1.00 or later
- Matrix N Standard Application Program Software: 1.00
- Products: Matrix 300N™ Matrix 410N™, XRF410N™
- PackTrack Calibration Pattern



**CAUTION:** print either the **A4** or **Letter** size pdf file according to the paper size you are using. Printing on the wrong size paper or rescaling the Calibration Pattern will cause PackTrack calibration errors.

- Tape Measure
- These instructions

### 10.2 TOP CALIBRATION USING DL.CODE



**CAUTION:** The conveyor must be STOPPED while performing this procedure!



**NOTE:** Standard Setup including optical Calibration must be completed before performing PackTrack Calibration.

Calibration is performed using the Calibration Pattern positioned on the plane corresponding to the tallest pack, (Near Plane, i.e. closest to the Matrix reader) and on the plane corresponding to the shortest pack, (Far Plane, i.e. farthest from the Matrix reader).

The PackTrack Calibration is completed only after both planes have been calibrated and saved in Flash.

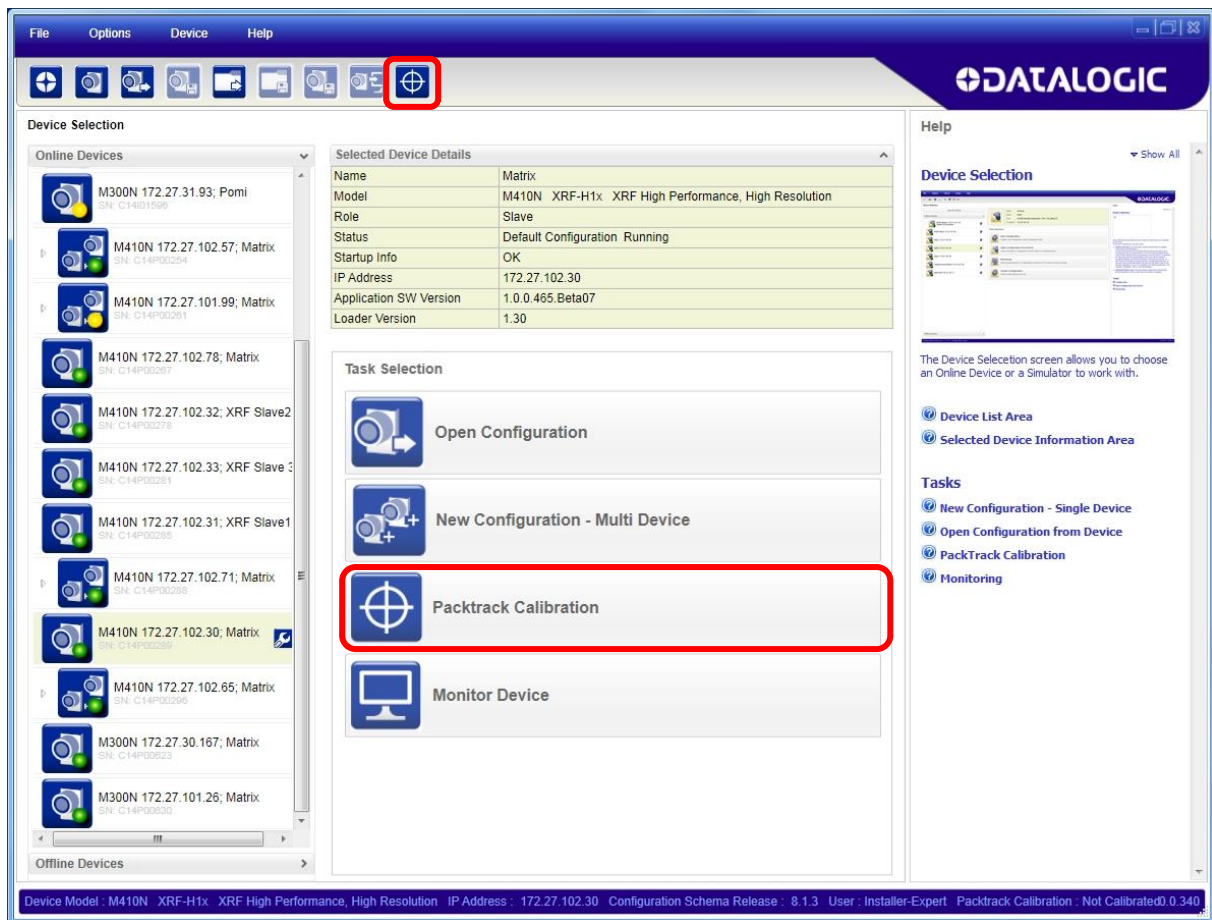


**NOTE:** Once a completed calibration is performed, it is not possible to perform calibration on a single plane, for example modifying one plane while maintaining the previous parameters of the other plane. The PackTrack Calibration always requires both steps to be completed.

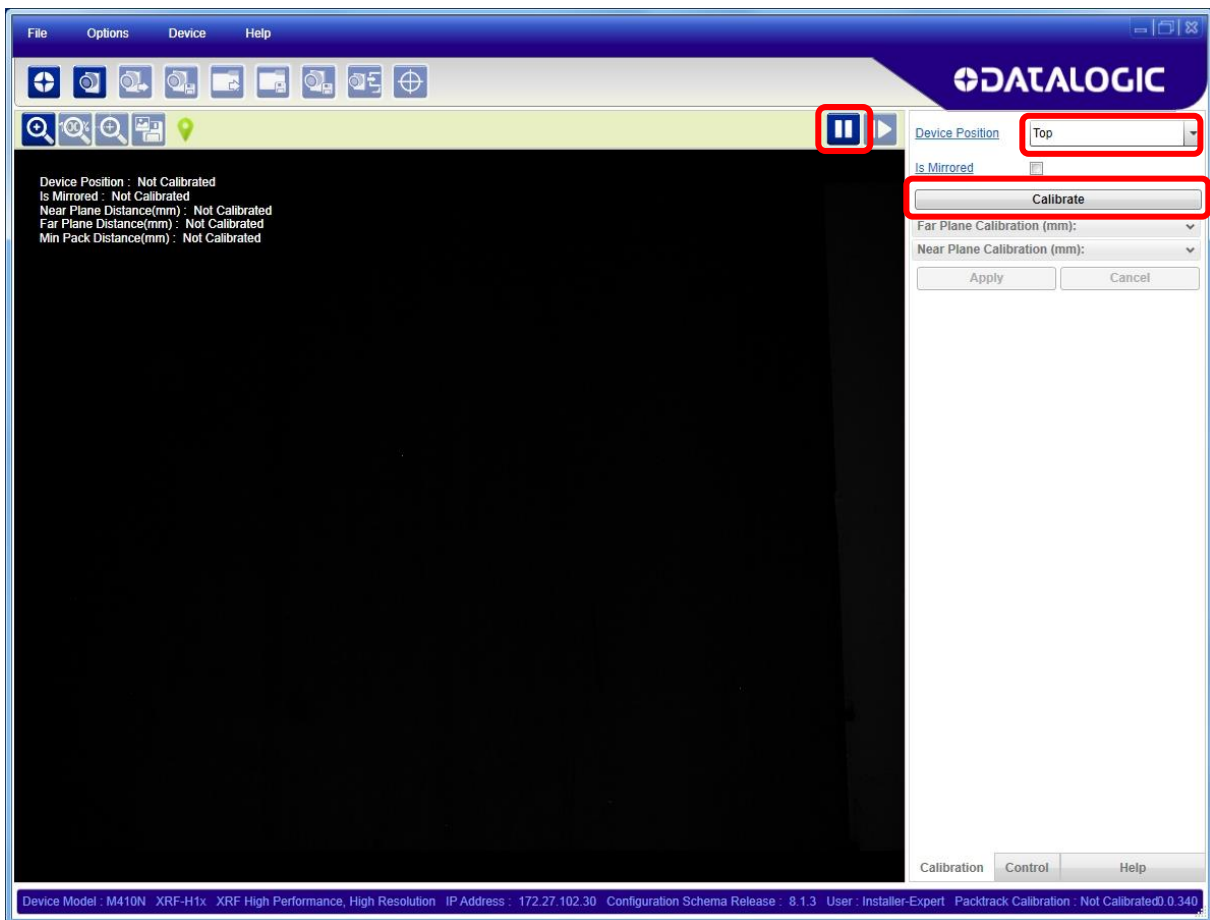


**STEP 1 – Run PackTrack Calibration:**

- a) Select **PackTrack Calibration** from the toolbar icon or item in the DL.CODE Task Area.



- b) Set the Device Position to **Top** from the dropdown list.
- c) Click on the **Calibrate** button to open the Calibration Planes panel for co-ordinate input.



## STEP 2 – Determine the PackTrack System Reference Point:

- a) Determine the PackTrack System Reference Point, if possible **on the conveyor frame surface**, where the X, Y, Z co-ordinates = (0,0,0). Visibly mark this point on a piece of tape or other surface, so that it can be used to make the measurements necessary for calibration. The Y = 0 value **normally** corresponds to the PS Line position.

## STEP 3 – Far Plane Calibration:



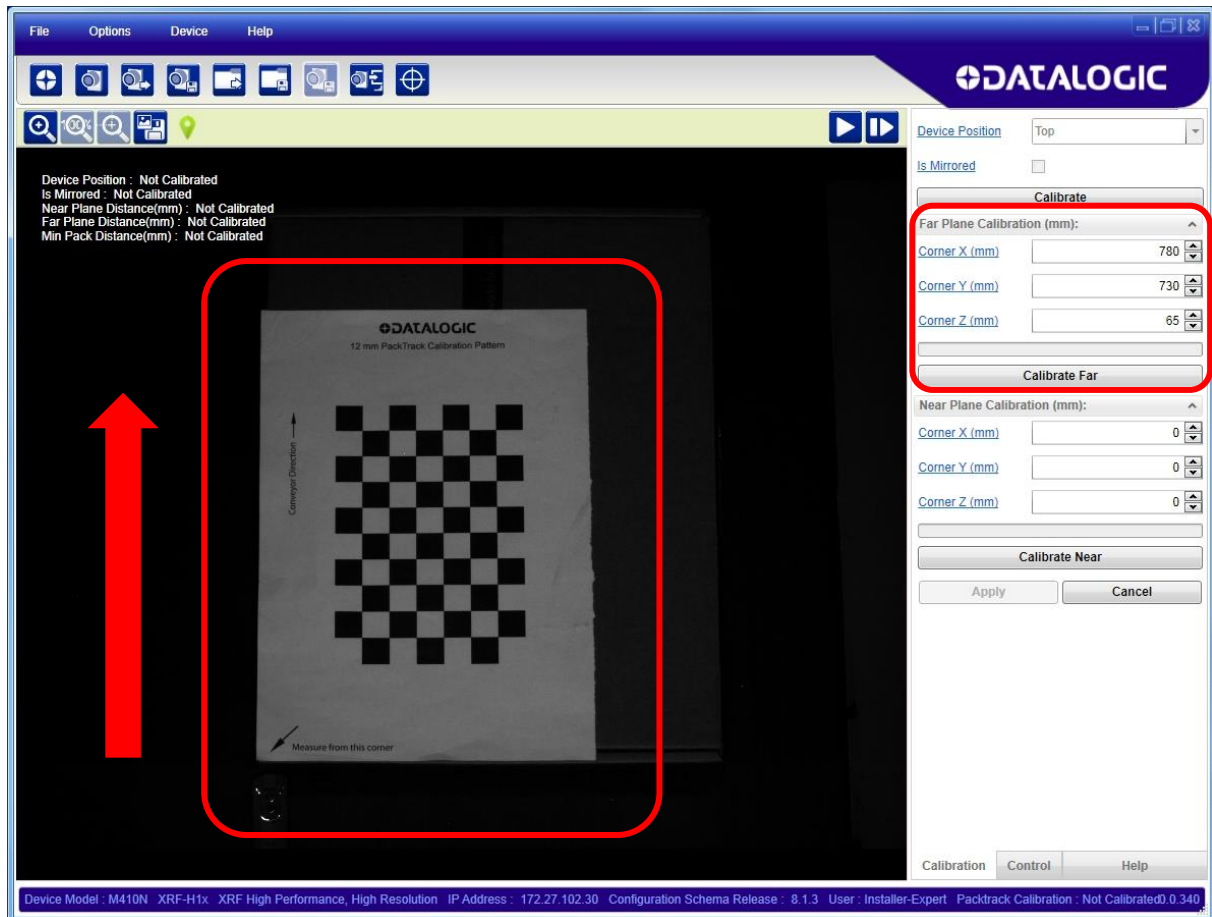
**NOTE:** Step 3 and Step 4 can be inverted.

- a) The reader should already be running (illuminator flashing and acquiring images) so that positioning can be seen on the monitor. The pause button should be shown indicating the reader is running.

- b) Place the Calibration Pattern so that it is completely visible in the monitor window and it corresponds to the plane representing the lowest pack allowed to pass through the system on the conveyor. This is the Far Plane which can also be on the conveyor surface.

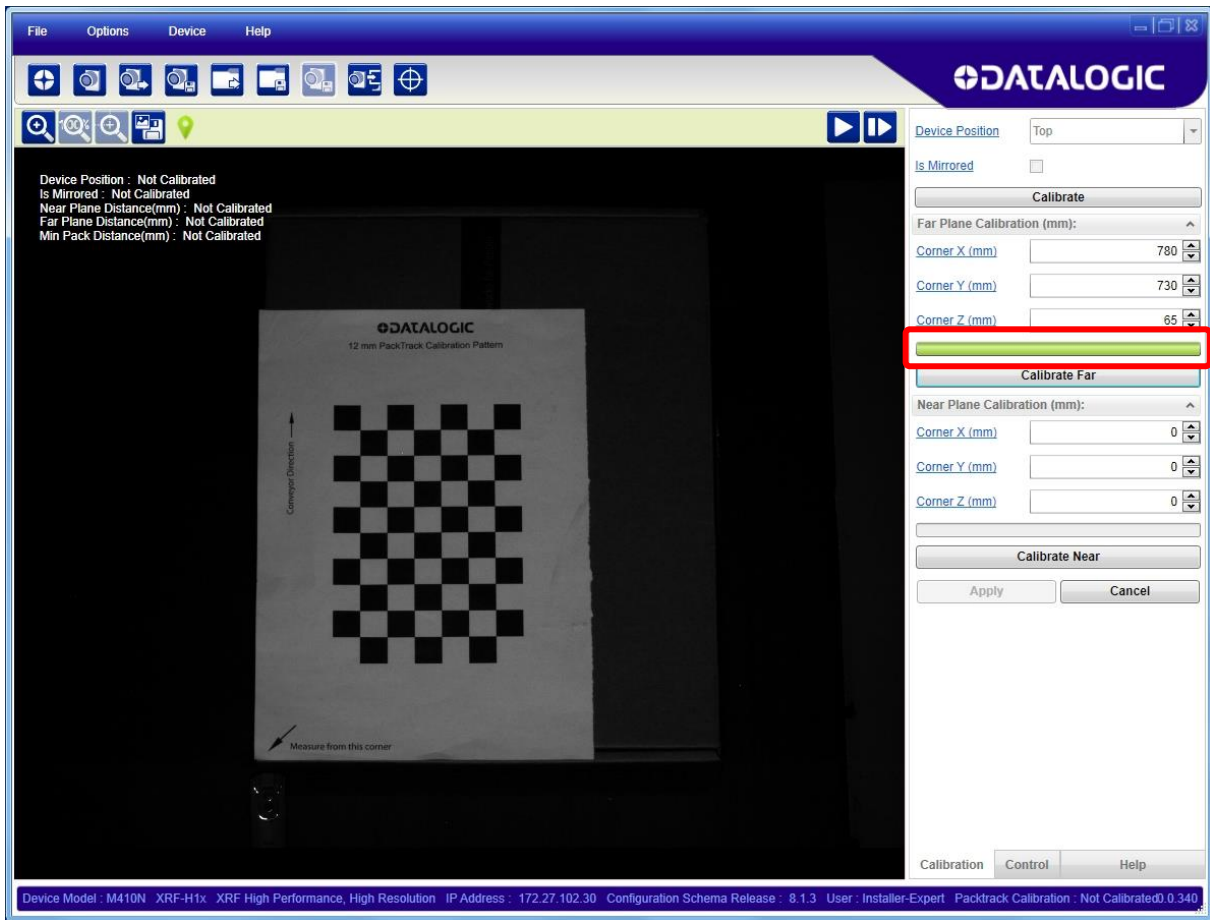


**NOTE:** the Calibration Pattern must be aligned so that the y-axis is parallel to the conveyor movement direction.



- c) Press the **Pause** button.
- d) Using the tape measure, physically measure the X, Y and Z offsets from the System Reference Point to the lower left corner of the Calibration Pattern and input this data (**mm**) into the Far Plane Calibration boxes.
- e) Press the **Calibrate Far** button for start Far Calibration.

- f) Wait until the operation finishes. An orange progression bar runs above the **Calibrate Far** button and should end in a solid green bar indicating successful calibration of the far plane.



### Possible Error Causes:

- Calibration Pattern is not completely contained in the Field of View.
- Calibration Pattern is partially obscured by objects covering it

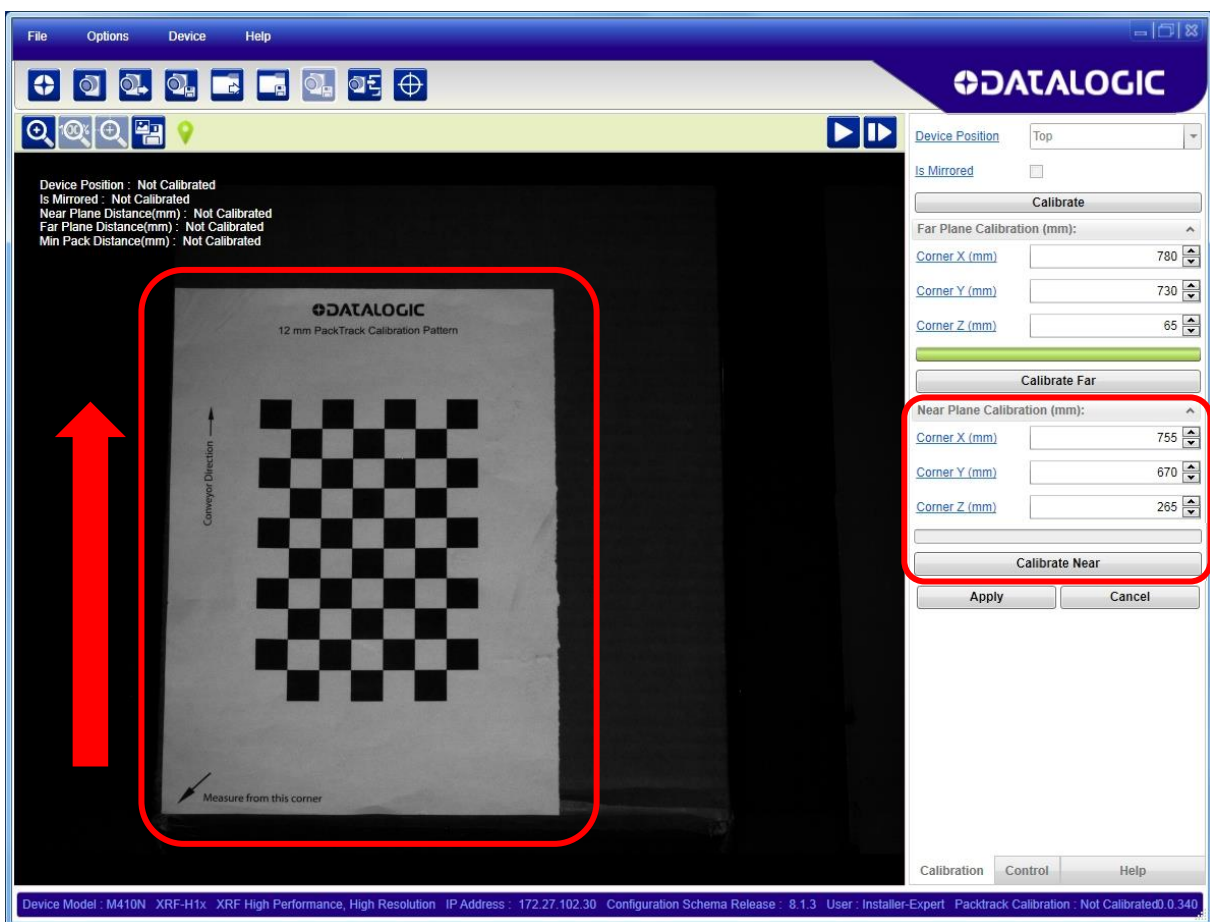
**STEP 4 – Near Plane Calibration:**

**NOTE:** Step 3 and Step 4 can be inverted.

- a) Press the **Play** button. The reader again begins to acquire images.
- b) Place the Calibration Pattern on a pack so that it is completely visible in the monitor window and it corresponds to the plane representing the tallest pack allowed to pass through the system on the conveyor. This is the Near Plane.

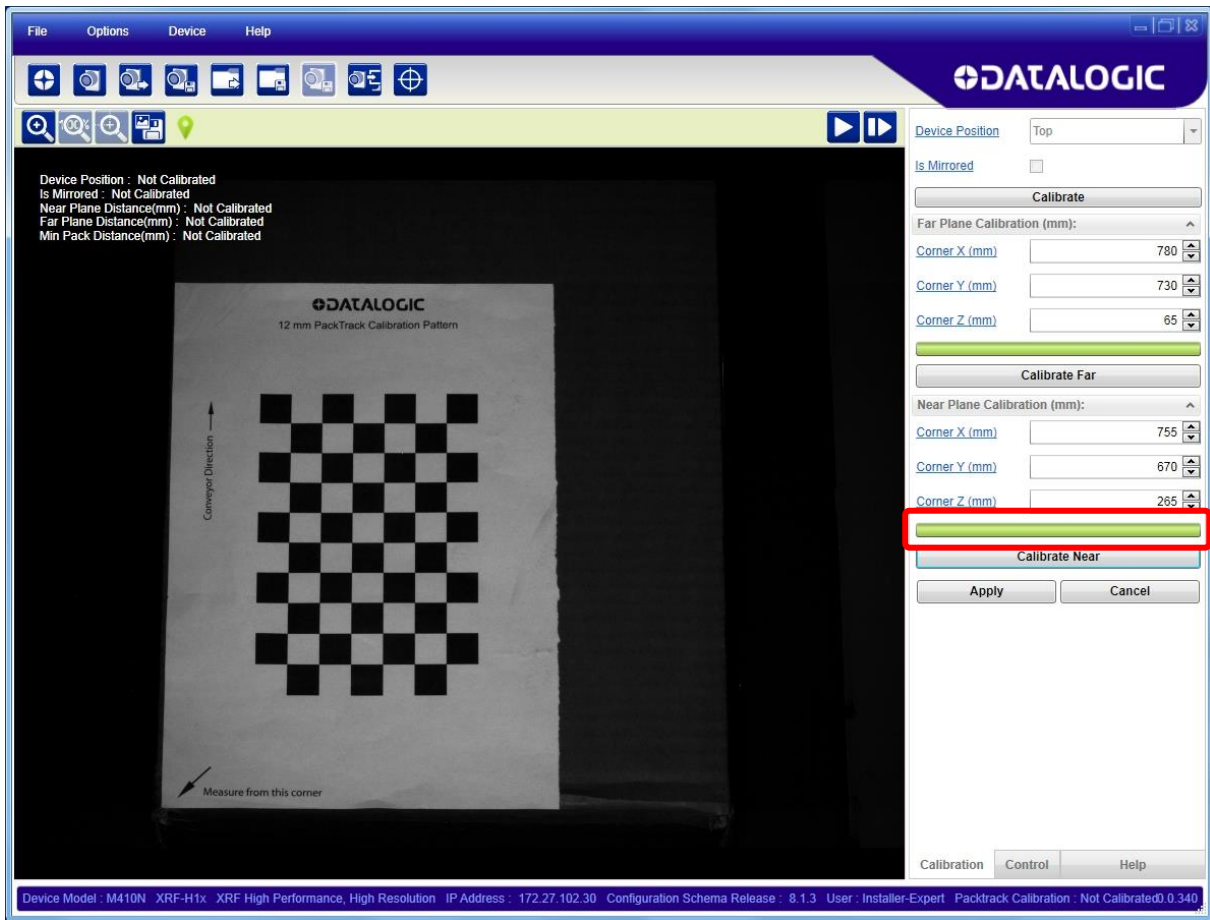


**NOTE:** the Calibration Pattern must be aligned so that the y-axis is parallel to the conveyor movement direction.



- c) Press the **Pause** button.
- d) Using the tape measure, physically measure the X, Y and Z offsets from the System Reference Point to the lower left corner of the pack (aligned with the Calibration Pattern) and input this data (**mm**) into the Near Plane Calibration boxes.
- e) Press the **Start** button for Near Calibration.

- f) Wait until the operation finishes. An orange progression bar runs above the **Calibrate Near** button and should end in a solid green bar indicating successful calibration of the near plane.



### Possible Error Causes:

- Calibration Pattern is not completely contained in the Field of View.
- Calibration Pattern is partially obscured by objects covering it

*In this case (first time calibration), it is possible to repeat the Near Calibration without losing the previously completed Far Calibration.*

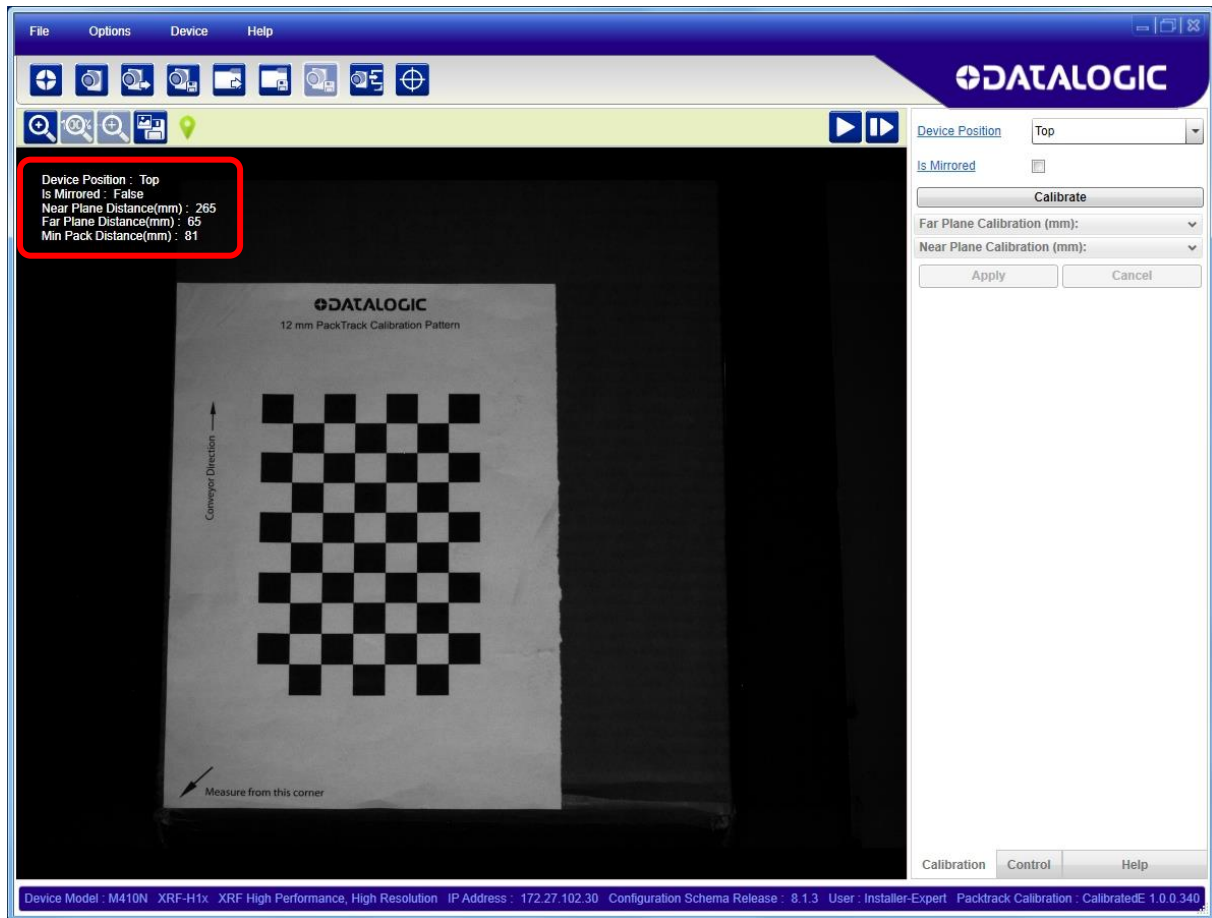


**NOTE:** the items in the monitor window are still shown as “Not Calibrated” because the calibration has not been saved yet.



**STEP 5 – Saving Calibration:**

- g) Click on the **Apply** button to save the calibration values in the reader's flash memory.

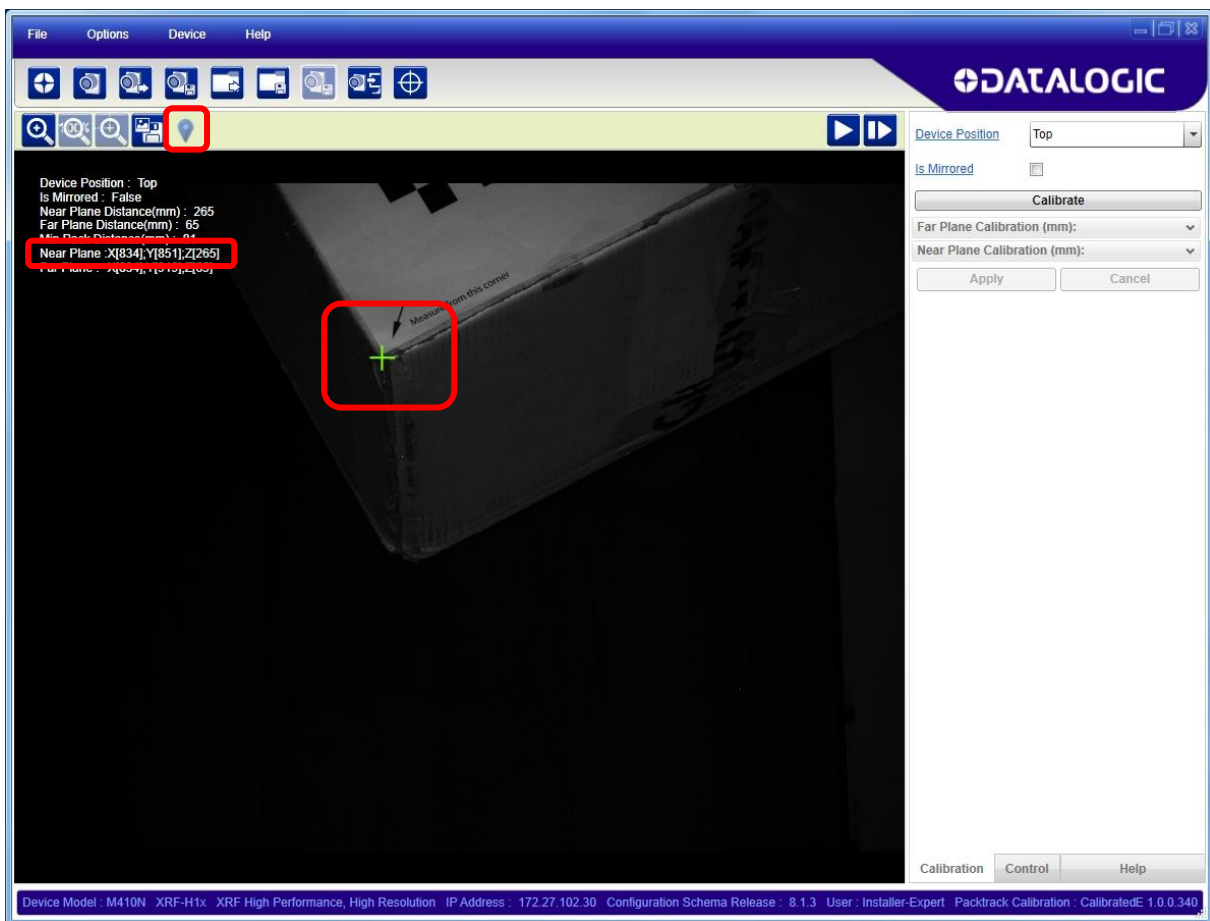


The calibration also advises the minimum distance between packs (Min Pack Distance), for which correct code to pack assignment can be guaranteed.

At this point PackTrack Calibration has been successfully completed.

**STEP 6 – Verify Calibration Results:**

- a) Place a pack, code or other object onto either the Near or Far plane at a different coordinate from the calibration, however it must be visible in the monitor window.
- b) Click on the **Show Real World Coordinates** icon. A green cross will appear in the monitor window. Drag this cross with the mouse to an easy-to-measure reference point (i.e. pack edge).
- c) Using the tape measure, physically measure the X and Y coordinates from the System Reference Point and compare them to the data shown in the monitor window for the reference plane you are measuring.



## 11 DPM CALIBRATION

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### 11.1 PRE CONFIGURATION

Before performing DPM Calibration the reader should be pre-calibrated using the Grade A test chart.

In addition there are several factors that require attention in order to produce the best decoding results for DPM code reading applications.

1. The best reading results occur in static applications (no code movement during image acquisition).
2. When using internal illumination, reduce skew angle to minimum to allow uniform lighting on the code surface.
3. The code should be placed as close as possible to the center of the FoV.
4. Reduce reading distance to reduce ambient lighting interference.
5. The best internal illumination chain combination in part depends on the reading distance. More light is applied to the surface at closer distances.

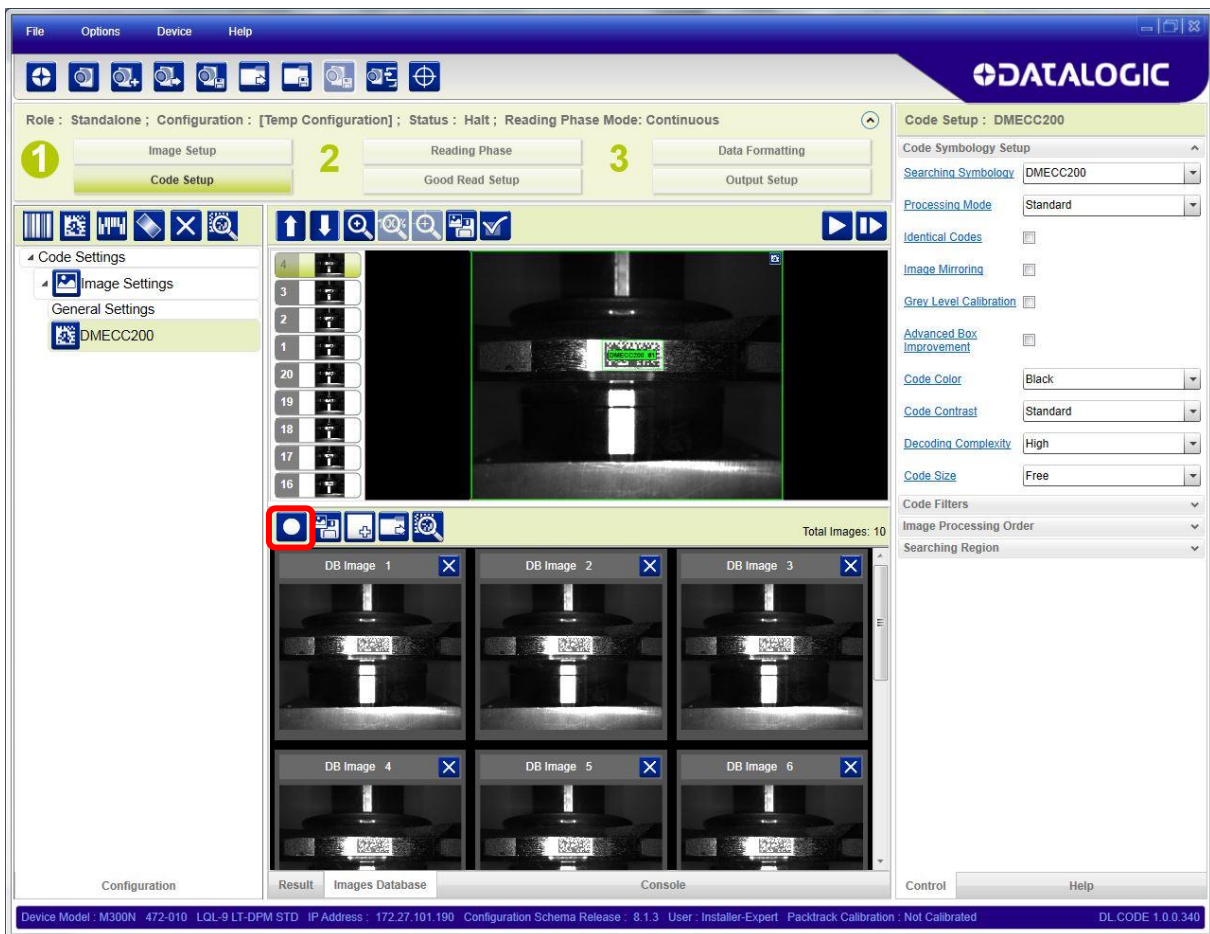
### 11.2 DPM AUTOLEARN

DL.CODE provides a DPM Autolearn Calibration tool to help find the best combination of parameters for DPM applications. This tool is sufficient for many DPM applications, however some particularly difficult applications may be improved by some manual calibration fine tuning.

## 11.3 DPM AUTOLEARN USING IMAGES DATABASE

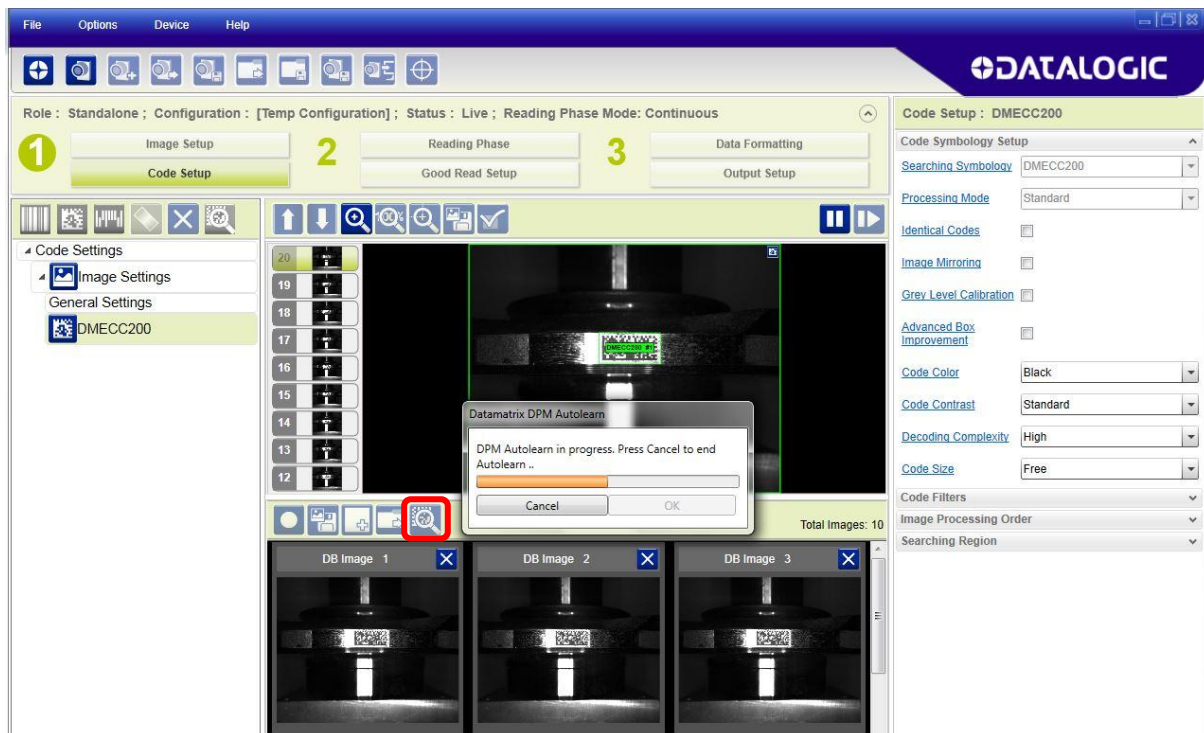
DL.CODE provides a DPM Autolearn Calibration tool to help find the best combination of parameters for DPM applications. This tool is sufficient for many DPM applications, however some particularly difficult applications may be improved by some manual calibration fine tuning.

1. After initial setup (Image Auto-Setup and Focusing), place the DPM code at the center of the FoV at the same reading distance.
2. From Code Setup, click on the Image Database tab at the bottom of the screen.
3. Click on the Start Recoding Images icon to start image recording.

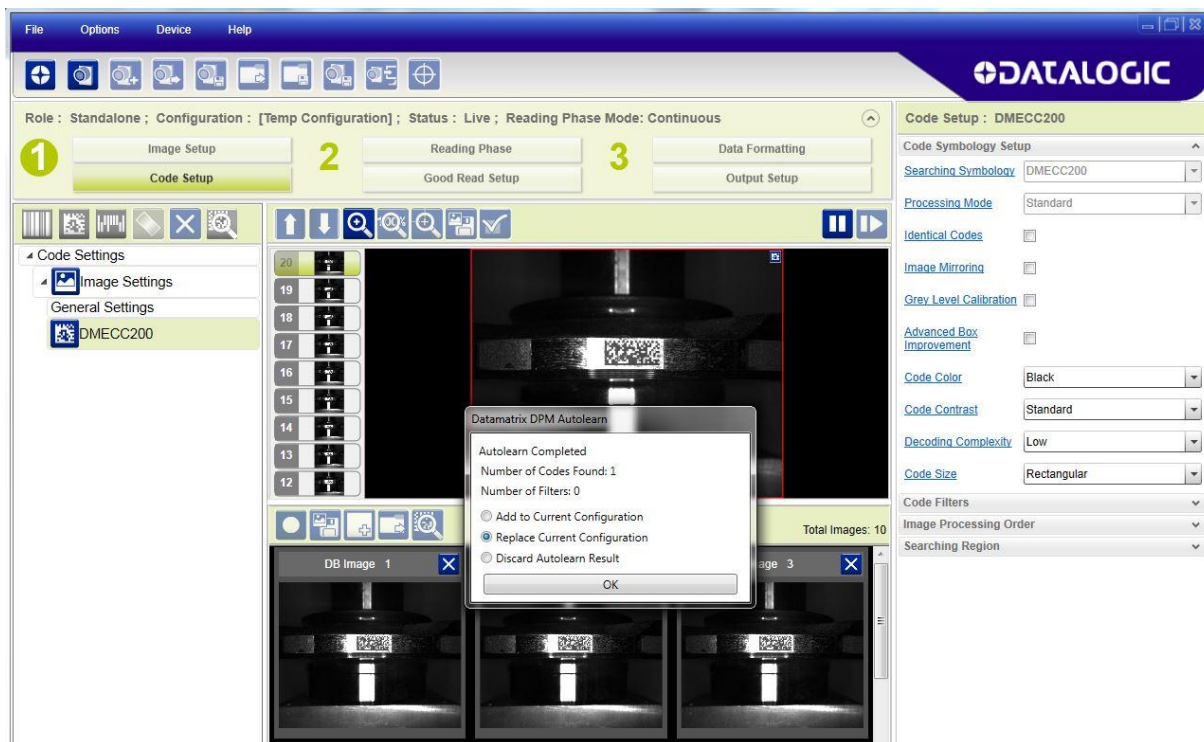


4. When several images have been acquired, click on the Stop Recoding Images icon to stop image recording. You will then see the images in the Image Database (saved to the Images Database Buffer).

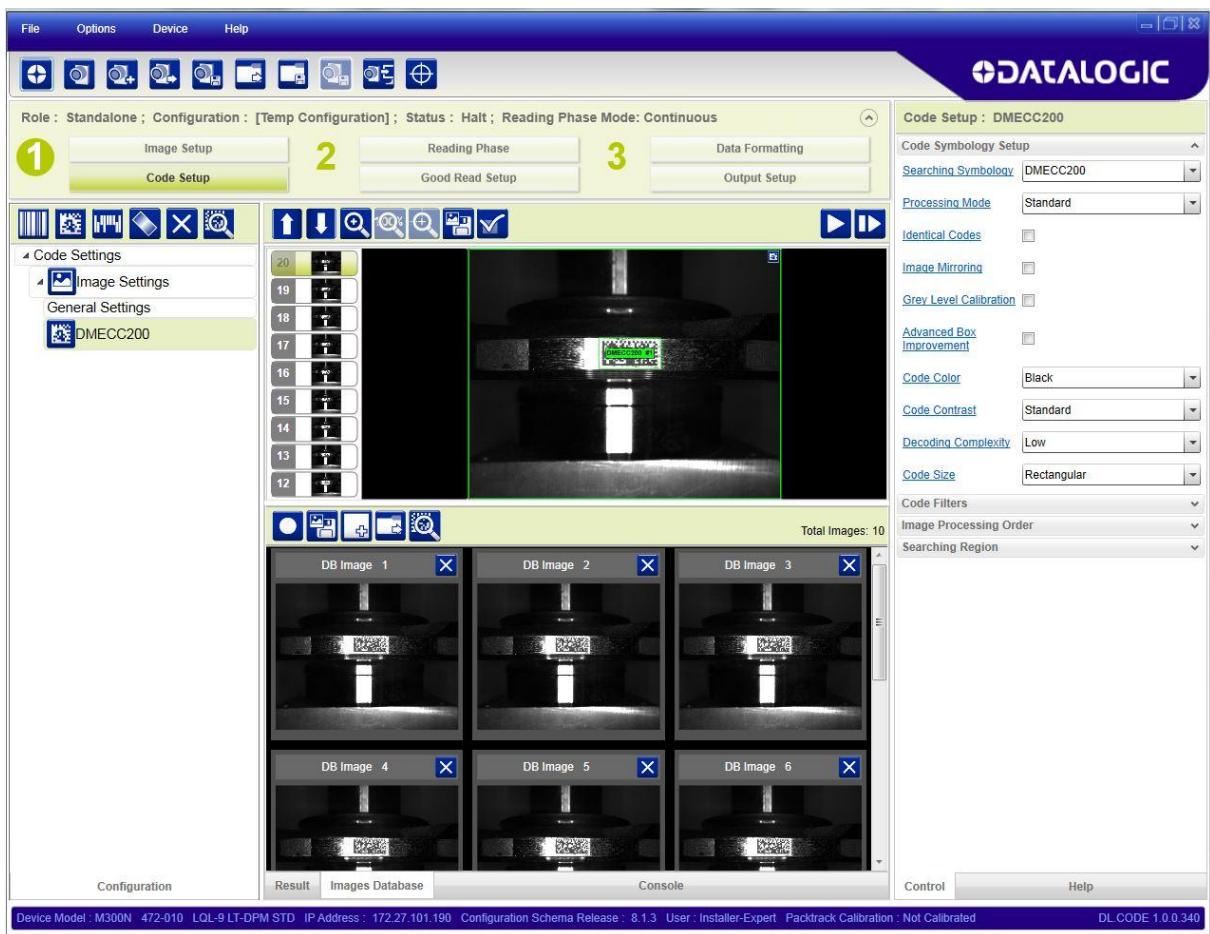
- Click on the DPM Autolearn icon to start the DPM calibration and wait until the calibration finishes.



- At the end of the calibration you will be prompted to **Add to or Replace the Current Configuration**, or to **Discard the Autolearn Result**.



Accepting the new configuration should show good decoding results in the monitor window.



## 11.4 DPM MANUAL CONFIGURATION



## 12 DEVICE ENVIRONMENT SETTINGS

### 12.1 ACCESSING DEVICE ENVIRONMENT SETTINGS

To access the device environment settings obviously the device must be connected to DL.CODE. From the Device>Settings>Environment menu open the Device Environment Configuration window.

This window presents the following fields:

**Device Name** (default “Matrix”) can be personalized by typing a new name in this field.

**Startup Configuration** which can be changed by selecting a different configuration from the dropdown list (if any).

**About Device** gives details about the various software components currently loaded and running on this device. This data is important to know for troubleshooting purposes.

### 12.2 ETHERNET SETTINGS

This window presents all the Ethernet Settings for correct device connection to the LAN.

It can also be accessed directly by clicking on the wrench icon in the device list area as shown in par. 3.1.

Change the Ethernet Settings (IP Address, Subnet Mask, Gateway Address etc.) according to the network requirements.

The **Keep Alive Timeout** parameter selects the period for which a signal is sent from the device to maintain the Ethernet connection with the DL.CODE UI configuration environment.

## 12.3 CLUSTER NETWORK SETTINGS

This window allows managing the device role in an ID-NET network (Master or Slave).

If the device is not in an ID-NET network then its role is Stand Alone.

A specific description can be typed into the **Device Description** field to distinguish this device from others in the network (i.e. a name to indicate the device position in the network).

The ID-NET Baud Rate is selected here and must be common to all devices in the network. See the device Reference Manual for details on ID-NET network configuration.

The screenshot shows the 'Device Environment Configuration' window. The 'Cluster Network Settings' section is expanded, showing the following fields: 'Device Name' (Matrix), 'Startup Configuration' (Default), 'Cluster Role' (Standalone), 'Device Description' (empty), and 'Cluster Baud Rate' (1Mb). Other sections like 'About Device...', 'Ethernet Settings', 'X-PRESS Configuration', 'LED Configuration', and 'Maintenance Settings' are collapsed. 'Cancel' and 'OK' buttons are at the bottom.

## 12.4 X-PRESS CONFIGURATION

This window allows managing the HMI X-PRESS™ behaviour. See the device Reference Manual for more details on the X-PRESS features.

**Configuration Status** enables/disables the X-PRESS features available through the multifunction key on the device.

**Number of Samples** selects the number of samples to analyze for the Test percentage.

**Test Timeout** sets when the expired timeout causes the Test feature to exit.

**Aim Timeout** sets when the expired timeout causes the Aim/Autofocus feature to exit.

**Saving Options** selects whether the X-PRESS Setup and Learn features will save their results to Permanent or Temporary memory. If set to Permanent memory, the configuration will be saved as the default configuration in the job list having the Configuration Name.

**Configuration Name** is the name given to the configuration saved to permanent memory by the X-PRESS Setup and Learn procedures.

**Autolearn Timeout** sets when the expired timeout causes the Learn feature to exit.

The screenshot shows the 'Device Environment Configuration' window with the 'X-PRESS Configuration' section expanded. It includes a 'Configuration Status' checkbox (checked), 'Number of Samples' (20), 'Test Timeout (s)' (180), 'Aim Timeout (s)' (180), 'Saving Options' (Permanent), 'Configuration Name' (HMIConfiguration), and 'Autolearn Timeout (s)' (180). The 'LED Configuration' and 'Maintenance Settings' sections are collapsed. 'Cancel' and 'OK' buttons are at the bottom.

## 12.5 PACKTRACK CALIBRATION

This window shows the PackTrack Calibration parameter settings (read-only) for the device.

The screenshot shows the 'Device Environment Configuration' window. The 'Device Name' is 'XRF Top1' and 'Startup Configuration' is 'Packtrack'. The 'Packtrack Calibration' section is expanded, showing the following settings: 'Device Position' is 'Top', 'Near Plane Distance (mm)' is '0', 'Far Plane Distance (mm)' is '315', and 'Min Pack Distance (mm)' is '140'. Other sections like 'About Device...', 'Ethernet Settings', 'Cluster Network Settings', 'X-PRESS Configuration', 'LED Configuration', and 'Maintenance Settings' are collapsed. 'Cancel' and 'OK' buttons are at the bottom.

## 12.6 LED CONFIGURATION

This window manages the device LEDs and Beeper behaviour.

**COM LED Function** selects whether the COM LED on the device (which signals activity on the Main Serial port) is ON when data is transmitted by the device (TX) or received from the Host (RX).

**Beeper Status** enables/disables the device beeper.

**Beeper Activation Events** selects which events will trigger the beeper.

**Beeper Deactivation Timeout** determines the length of the beeper signal.

**LEDs Deactivation Timeout** determines the length of time the LED signals are ON.

The screenshot shows the 'Device Environment Configuration' window. The 'Device Name' is 'Matrix' and 'Startup Configuration' is 'Default'. The 'LED Configuration' section is expanded, showing: 'COM LED Function' is 'Main Serial Port TX', 'Beeper Status' is checked, 'Beeper Activation Events' includes 'Good Read / Success / Code Match' and 'Multiple Read' (checked), and 'No Read / Failure / No Match' is unchecked. 'Beeper Deactivation Timeout (ms)' is '10', 'LEDs Deactivation Timeout (s)' is '30', 'Focusing Pointer Status' is 'Calibration Only', and 'Multiple Read Treated As' is 'Complete Read'. The 'Maintenance Settings' section is collapsed. 'Cancel' and 'OK' buttons are at the bottom.

**Focusing Pointer Status** (for devices with laser pointers) sets the aiming system management: **Disabled** - laser pointers always OFF; **Always On** - laser pointers always ON; **Calibration Only** - laser pointers only ON during calibration procedures.

**Multiple Read Treated As** determines which device LED will be activated on a Multiple Read event: **Complete Read** – the Good Read LED will be activated; **No Read** – the Status LED will be activated.

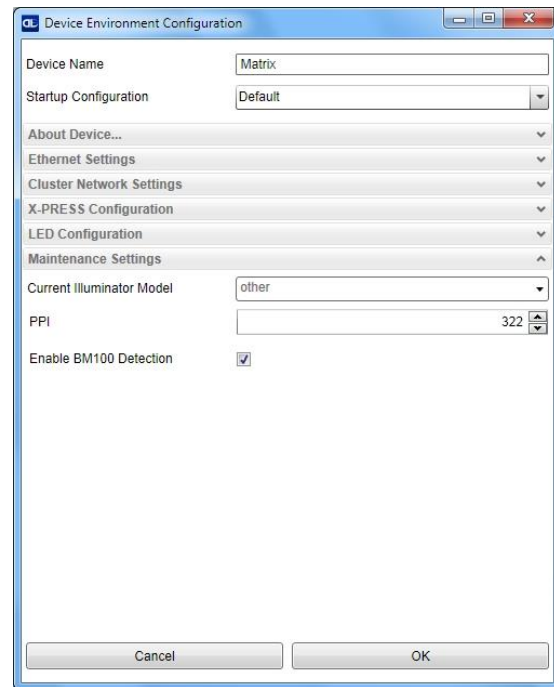
## 12.7 MAINTENANCE SETTINGS

**Current Illuminator Model** shows the internal illuminator model associated with this device.

If the device is not correctly associated with its internal illuminator incorrect functioning and/or damage can occur. For Matrix 410N devices see the following Illuminator Management procedure.

**PPI** is the same value saved in the Image Setup **Acquire PPI** image density setting procedure. Here it can be set manually although it is advised to use the Acquire PPI procedure.

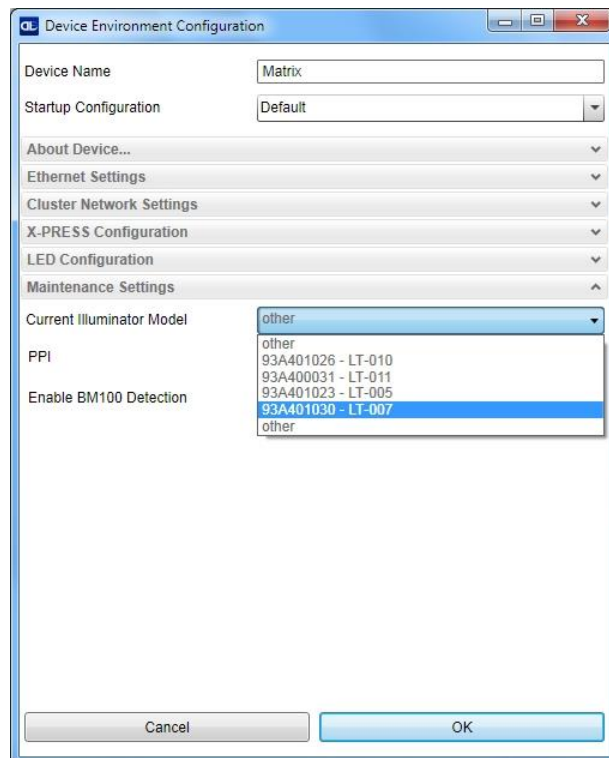
**Enable BM100 Detection** if enabled, at startup, the reader sends a message to recognize the presence of, and communicate with, the External Backup Memory (BM100 Backup Module or integrated QLM-Series accessories). If using the Backup Memory, this parameter must be enabled.



### DL.CODE Illuminator Management Procedure for Matrix 410N

1. In the DL.CODE Maintenance Settings > Current Illuminator Model item, select the correct Illuminator being used from the dropdown list.
2. Click OK and at the device reset prompt click Yes and wait until the device resets. You can confirm by reopening this item from the same menu.

The above procedure must also be performed before any attempt to use the X-PRESS configuration on readers mounting the LT-005, LT-007, LT-010 or LT-011 illuminators.



## 13 MAINTENANCE

As with nearly all electronic components, performance may drift over time making it necessary to calibrate the device at periodic intervals for optimal reading performance. The Recalibration Tool provided in DL.CODE guides you through the recalibration procedure. You may also contact our Technical Support team for assistance.

**This procedure is intended to be performed by trained technicians and not performed frequently (i.e. only after several years of operation and only if the focus level adversely affects decoding).**

### 13.1 RECALIBRATION METHODS FOR SOFTWARE ADJUSTABLE FOCUS MODELS

The recalibration may be executed in two modes: automatic or manually.

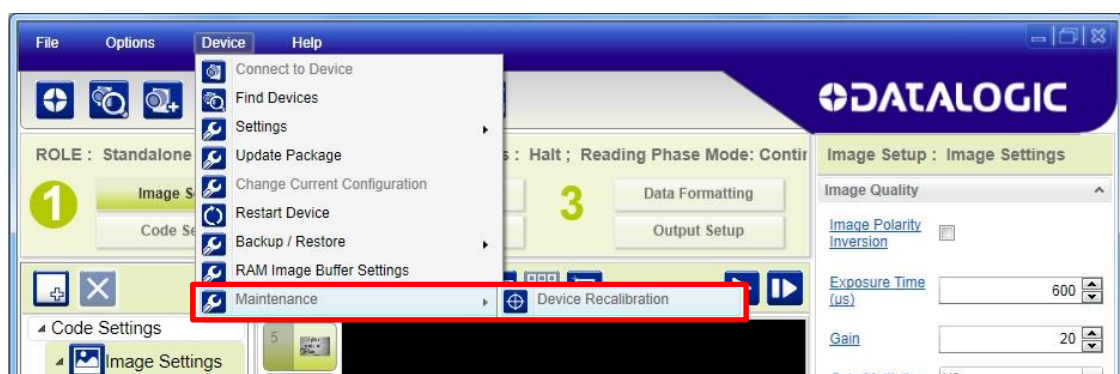
The **Automatic procedure** is the preferable and advised procedure. It must be executed in a correct setup condition, using the **Grade A** Code 128 barcode test chart included in the package with the reader or available in the SW-DOCS-TEST CHART accessory 93ACC0148. The Test Chart must be placed at the same reading distance used by the running configuration and positioned at the center of the view area.

The **Manual procedure** should only be used if it is not possible to place the test chart in front of the reader (i.e. mechanical obstacles due to the mounting of the device). This method does not need any test chart. The proper focus level is determined directly by the user who will visually evaluate the captured images until the desired focus quality is reached.

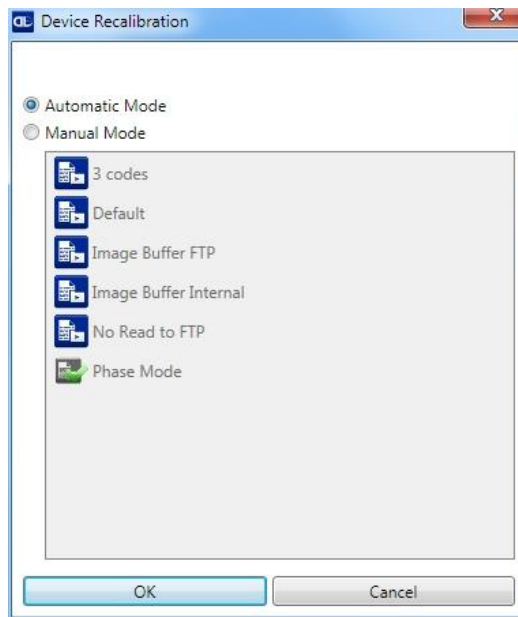
When the correct focus level is found (regardless of the method used), it must be saved in the device flash. The data saved is the correction value, while the factory calibration table is kept unchanged. The correction table can also be deleted, returning the device to the factory calibration level.

#### 13.1.1 Automatic Recalibration

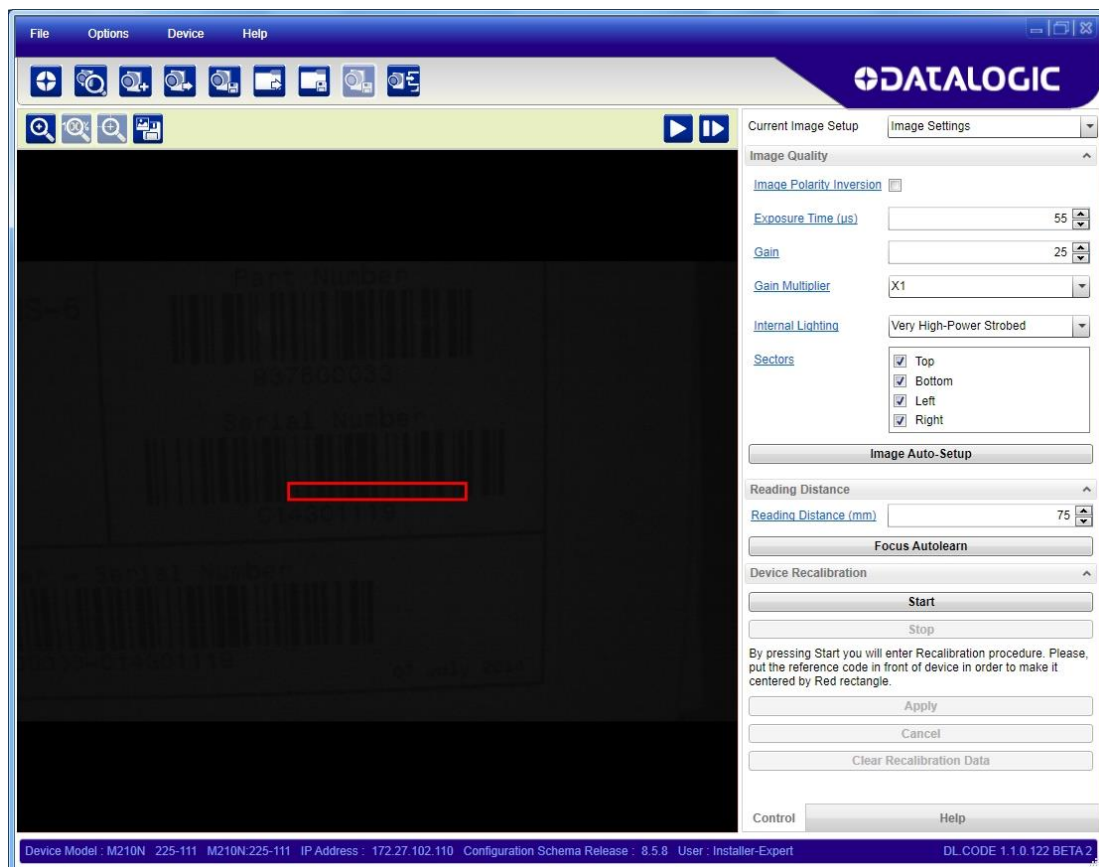
- 1) Before starting the procedure it is advised to take note of the **Reading Distance** value from the Image Setup window of the running configuration. In this example it is 80 mm.
- 2) Select Device>Maintenance>Device Recalibration



- 3) In the dialog window select Automatic and OK.



Now the calibration task appears with a pre-defined configuration: Continuous mode, only Code 128 enabled, reading distance 75 mm and default image setup.

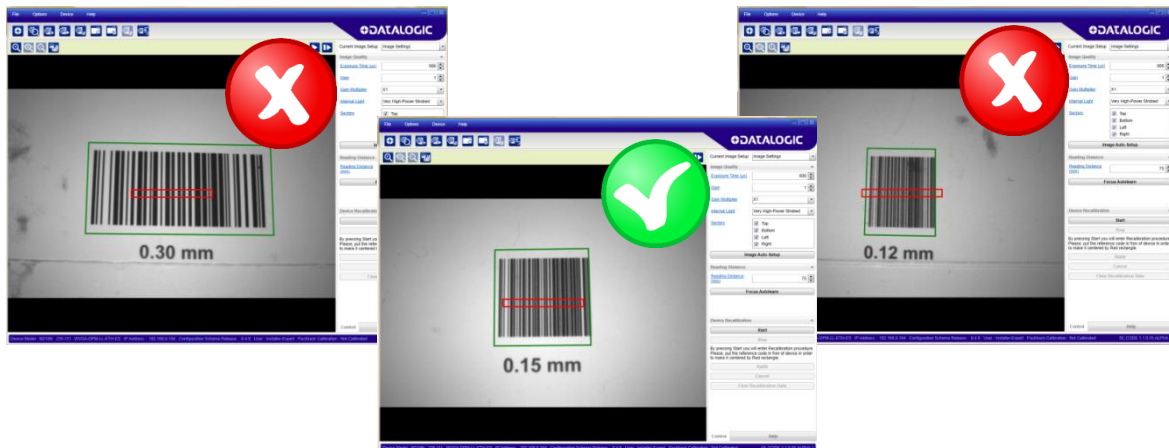


- 4) Place the test chart in front of the device at the desired working reading distance (80 mm for this example) with a certain skew to avoid direct reflections (i.e. 10-15 degrees). The Reading Distance is the distance from the middle point between the two laser pointers on the target (code surface) and the device reading window/lens cover.



- 5) Execute the **Image Auto-Setup** in order to setup the correct exposure/gain.
- 6) Place the test chart in front of the device with the following rules:
  - a. The focus level for recalibration is calculated within the red box shown on the screen. Therefore the code must be placed so that the entire red box contains bars of the code.
  - b. Choose the smallest test chart code that still entirely fills the red box.

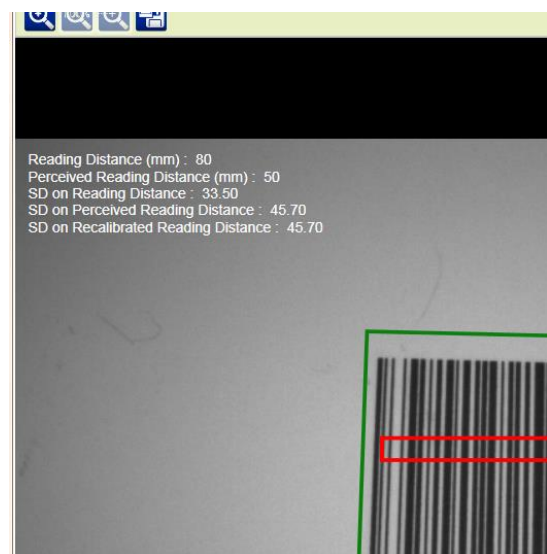
See the following examples for reference.



- 7) **Set the proper Reading Distance value.** Do not forget to perform this calibration step otherwise it will possibly lead to unfocused images.
- 8) Press “Start” button.

Initially the same steps made by the **Focus Autolearn** are performed, so the image may change lighting and focus level. When finished, summary data are shown in the image area:

The reported Reading Distance (mm) is the real distance from the target and it should correspond to the value previously set at step 6).




If the code is not positioned properly, the procedure will fail and an error message will appear.



- 9) Press **Apply** to write correction data in flash or press **Cancel** to discard the recalibration data calculated but not yet saved.

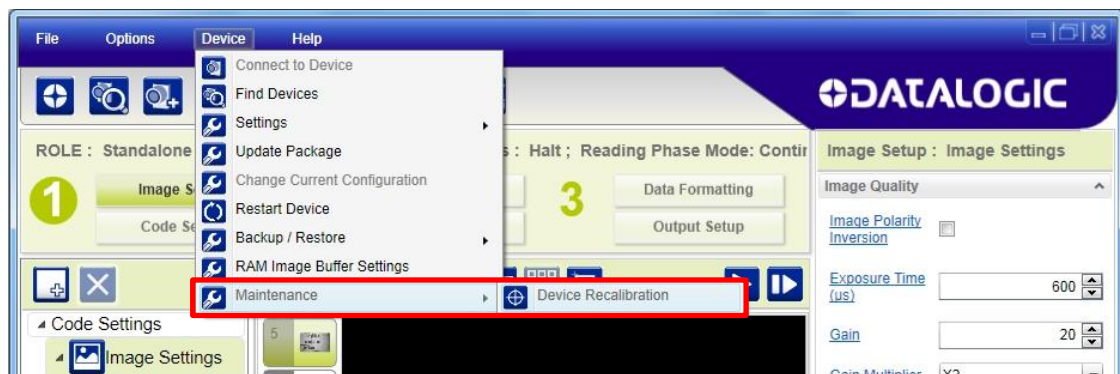


**NOTE:** Pressing **Clear Recalibration Data**, available only if at least one recalibration has been performed and saved, will clear the correction table and return the device to factory calibration values without any correction.

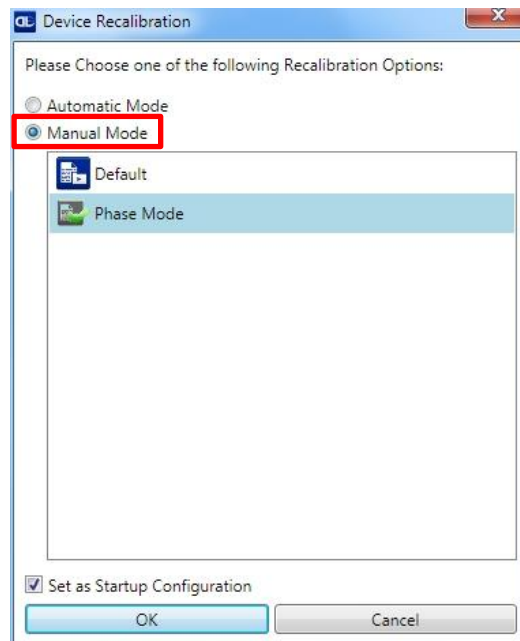
- 10) To exit, click on the **Open from Device** icon  (from the Toolbar) and choose the proper application configuration from the list of saved jobs.

### 13.1.2 Manual Recalibration

- 1) Select Device>Maintenance>Device Recalibration



- 2) In the dialog window select Manual and the desired working configuration, then press OK.

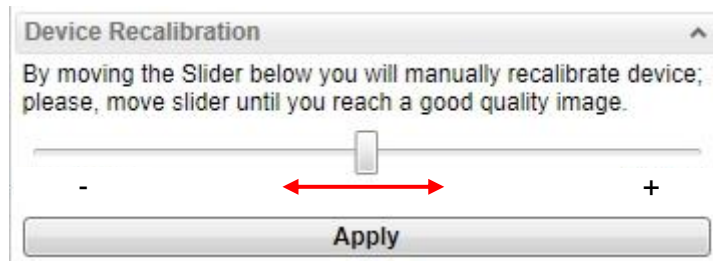


Now the calibration task appears with the selected configuration.



For this method there is no need to use any test chart. Simply place the target in view of the device at the reading distance. There is no need to have a code in the center of the view area; however the target should have some writing or a pattern for visual focus to be evaluated. The red box is meaningless.

- 3) If needed press **Image Auto-Setup**, but since this is a working configuration, it should already be set correctly.
- 4) There is no need to change the Reading Distance parameter for the same reason.
- 5) Change the focus level by dragging the slider with the mouse.




When the slider is released by the mouse, the image is captured and the screen is refreshed with the new image. Since the focus level is determined visually, for better evaluation use the zoom-in and zoom-out features.


- 6) Press **Apply** to write correction data in flash or press **Cancel** to discard the recalibration data.



**NOTE:** Pressing **Clear Recalibration Data**, available only if at least one recalibration has been performed and saved, will clear the correction table and return the device to factory calibration values without any correction.

- 7) To exit, click on the **Open from Device** icon  (from the Toolbar) and choose the proper application configuration from the list of saved jobs.

## 14 TROUBLESHOOTING

Problem	Solution
Device is not displayed in the Device Selection Area	In order to be found by DL.CODE, Online devices must be powered on and connected to the Local Area Network; if you don't see the desired device within this list, please verify its connections to the LAN and assure it is powered on; then click on the Discovery icon to run a new device search.
Cannot Configure the Device (parameters and icons appear in grey)	The device is in run mode. Click on the Pause button  to exit run mode.
The User is not able to download images	the FTP Username and FTP Password must be the same as the ones defined in the FTP Client.
Some Images are missing	<p>Image availability depends heavily on the number of images transferred and the rate of transfer, (system throughput and network bandwidth). Since Image downloading is usually based on specific criteria (i.e. No Read or Multiple Read conditions) the FTP Server is adequate to handle most applications.</p> <p>In extreme cases where a high throughput application requires all images to be downloaded it is possible that some images may not be available on the reader having been overwritten in the device's circular buffer. See an example in the figure below.</p>



 **DATALOGIC**

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